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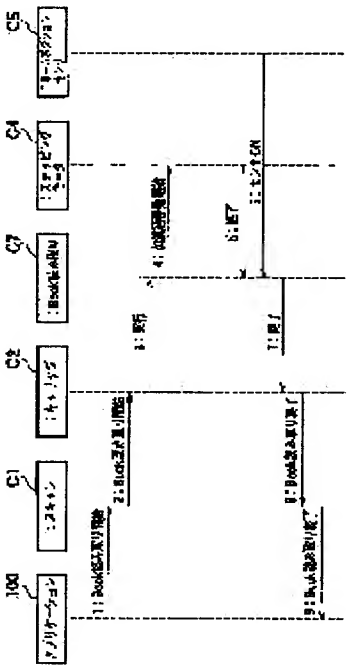
(54) SCANNER CONTROL SYSTEM AND IMAGE FORMING DEVICE PROVIDED WITH THE SAME

(57)Abstract:
PROBLEM TO BE SOLVED: To perform scanner control while cooperatively operating respective components by comprising software for performing scanner control of plural independent software components.
SOLUTION: Concerning the scanner control system of the image forming device, the software for performing scanner control is composed of a scan component C1, carriage component C2, carriage roll component C3 and software components C4 and C5, with which respective devices such as sensor and stepping motor required for read control are directly controlled, constituted as respectively independent components. A scanner is controlled by mutually cooperatively operating the respective software components and an original is read.



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CLAIMS

[Claim(s)]
[Claim 1]A software part which receives a read request constituted considering composition of software which controls a scanner which reads a manuscript as parts which became independent respectively, A software part which manages a running body which reads, and a software part which controls a running body according to various read requests, A scanner control system performing reading control of a manuscript while it constitutes from a software part which controls directly each device, such as a sensor required for reading control, and a stepping motor, and each software part carries out coordination operation mutually.
[Claim 2]in a scanner control system indicated to claim 1 -- the above -- a software part which controls a running body according to various read requests being made into an abstract class, and, A scanner control system constituting a subclass of this software part from a software part which operates a carriage.
[Claim 3]in a scanner control system indicated to claim 2 -- the above -- a scanner control system using as the same manipulation interface a software part which controls a running body according to various read requests, and a software part of a subclass of this software part.
[Claim 4]Composition of software which controls a scanner which reads a manuscript A scan part article, A scanner control system performing reading control of a manuscript while it constitutes from a carriage part article and stepping motor parts, it constitutes as independent parts which carry out coordination operation of each software part of each other and each carries out coordination operation.
[Claim 5]A scanner control system, wherein an internal configuration of the above-mentioned scan part article consists of a scanning class which is an abstract class with a manipulation interface from other parts, and a subclass with a common manipulation interface in a scanner control system indicated to claim 4.
[Claim 6]In a scanner control system indicated to claim 5, a subclass of the above-mentioned scanning class, A scanner control system carrying out reading control of a manuscript because exist corresponding to each service of software which performs manuscript reading and each subclass sends a required message to a carriage part article according to the contents of service.
[Claim 7]A scanner control system unifying a manipulation interface from a carriage part article to a subclass of a scanning class in a scanner control system indicated to either of claims 5 and 6.
[Claim 8]A stepping motor class in which an internal configuration of the above-mentioned stepping motor parts performs status management of a stepping motor in a scanner control system indicated to claim 4, A scanner control system consisting of a class which controls a device by stepping motor roll class which abstracted and had a drive system of a stepping motor, and a subclass of the above-mentioned stepping motor roll class according to a drive system of a stepping motor.
[Claim 9]A scanner control system unifying a manipulation interface to a subclass of the above-mentioned stepping motor roll class in a scanner control system indicated to claim 8.
[Claim 10]An image forming device provided with a scanner control system indicated to either of claims 1 thru/or 9.

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DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Field of the Invention]The parts-ized software is used in this invention.
Therefore, while making expansion easy, it is related with the image forming device provided with the scanner control system which raised the development efficiency of software, and this scanner control system.

[0002]
[Description of the Prior Art]In recent years, in response to a performance rise and low-cost-izing of computer hardware, increase of the scale of software and complication of the problem used as the object are increasing every year. On the other hand, the development cycle of these software goods or the goods of the apparatus incorporating software tends to be shortened every year. In the software industry, the improvement of the development efficiency serves as an inevitable demand in such environment. Part-ization of software can be considered as the one solution. This tends to intend to constitute a software system with two or more independent components (software part), and to reuse by other systems in the component unit. Thereby, long-term software development efficiency is improvable inside. About the automatic generation method of a software part. For example, "program automatic generation by a data center type software part" (JP,5-108319,A), A "program generation system" (JP,9-204301,A), a "software automatic generation device" (JP,10-240514,A), The proposal of "the object-oriented-development method of a control device" (JP,8-185424,A), etc. again the thing about a software part for example, Although a "software part reuse method" (JP,6-250,A), a "software part device" (JP,7-141,A), etc. are exhibited, about the part-ized method for control of a scanner, it has not been proposed yet.
[0003]
[Problem(s) to be Solved by the Invention]In the software system which controls the scanner which reads a manuscript, the technical problem of this invention is in raising the reusability of software by performing part-ization peculiar to the field (here scanner). The purpose of an invention of claim 1 a read request specifically for the composition of the software which controls the scanner which reads a manuscript A ****** software part, The software part which manages the running body which reads, and the software part which controls the running body according to various read requests, It constitutes from a software part which controls directly each device, such as a sensor required for reading control, and a stepping motor, By performing reading control of a scanner, while each software part is constituted as independent parts which carry out coordination operation mutually and each carries out coordination operation. It is applying this software part to many models, and making extension of a scanner control function easy, and raising software development efficiency.
[0004]The purpose of an invention of claim 2 is to make extension of the function of a scanner easy by making a carriage roll part into an abstract class, constituting, that is, making it a layered structure with the software part which controls the carriage [subclass / of a carriage roll part] according to a scan request.
[0005]The purpose of an invention of claim 3 is to make the same the manipulation interface of a carriage roll part and the software part of the subclass, and is making expansion of a scanner easy and raising the reliability of software.
[0006]The software part (it is called a scan part article.) which the purpose of an invention of claim 4 receives the demand of reading for the composition of the software which performs scanner control, and performs directions of operation to a running body according to a demand, The software part (it is called a carriage part article.) which controls a running body according to each state at the time of reading, It constitutes from a software part (it is called stepping motor parts.) which drives a stepping motor required in order to move a running body, By performing reading control of a scanner, while each software part is constituted as independent parts which carry out coordination operation mutually and each carries out coordination operation. It is applying

this software part to many models, and making extension of a scanner control function easy, and raising software development efficiency.
[0007]The purpose of an invention of claim 5 the composition of the software which performs scanner control A scan part article, The abstract class (it is called a scanning class.) which consisted of a carriage part article and stepping motor parts, and had a manipulation interface from other parts for the internal configuration of a scan part article, By performing reading control of a scanner, while it constitutes from a subclass with a common manipulation interface, it constitutes as independent parts which carry out coordination operation of each software part of each other and each carries out coordination operation. It is carrying out the addition of the control system of a scanner, making a change easy, and raising software development efficiency.
[0008]Abstract class, i.e., scanning class, which had a manipulation interface from other parts for the composition of the scan part article which the purpose of an invention of claim 6 receives the demand of reading, and performs directions of operation to a running body one by one according to a demand, Constitute from a subclass with a common manipulation interface, and the subclass of the above-mentioned scanning class, . Existed corresponding to each service of the software which performs manuscript reading, and each subclass embraced the contents of service. It is holding the information on usage **** of a carriage part article, that is, knowing, carrying out reading control of a manuscript by sending the required message to a carriage part article, carrying out the addition of the function (service) of scanner control software, making a change easy, and raising software development efficiency.
[0009]The purpose of an invention of claim 7 is a thing which unify the manipulation interface from the above-mentioned carriage part article to the subclass of a scanning class and for which things are done, It is lessening the changing amount of other software parts at the time of an addition and change of the function (service) of scanner control software, and raising the reliability of a software part.
[0010]The class from which the purpose of an invention of claim 8 constitutes the software part which drives a stepping motor for the status management of a stepping motor, By the abstract class with the role which drives a stepping motor, and the subclass of the above-mentioned stepping motor roll class. With constituting from a class which controls a device according to the drive system of a stepping motor, the addition of the drive system of a stepping motor is carried out, a change is made easy, and it aims at raising software development efficiency.
[0011]The purpose of an invention of claim 9 is to unify the manipulation interface to the subclass of the above-mentioned stepping motor roll class, and is carrying out an addition, and making a change of a motor driving system easy, and raising the reliability of a software part.
[0012]The purpose of an invention of claim 10 is to provide the image forming device provided with the scanner system indicated to either of claims 1 thru/or 9.
[0013]
[Means for Solving the Problem]An external-interface part with which this invention receives image data, for example from an external system, In an image forming device which has a delivery bottle part for distributing and placing a recorder which saves a picture, a plotter section which prints a picture on a paper, a scanner part which reads a picture, and a printed paper, etc., Software which controls a scanner which reads a manuscript is constituted by two or more independent parts, As a scanner control system has a mechanism in which it operates by coordination operation of these parts, an invention of claim 1, A software part which receives a read request constituted considering composition of software which controls a scanner which reads a manuscript as parts which became independent respectively, A software part which manages a running body which reads, and a software part which controls a running body according to various read requests, While it constitutes from a software part which controls directly each device, such as a sensor required for reading control, and a stepping motor, and each software part carries out coordination operation mutually, it is a scanner control system performing reading control of a manuscript.
[0014]In a scanner control system with which an invention of claim 2 was indicated to claim 1, the above -- it is a scanner control system having made into an abstract class a software part which controls a running body according to various read requests, and constituting a subclass of this software part from a software part which operates a carriage.
[0015]In a scanner control system with which an invention of claim 3 was indicated to claim 2, the above -- it is a scanner control system using as the same manipulation interface a software part which controls a running body according to various read requests, and a software part of a subclass of this software part.
[0016]An invention of claim 4 composition of software which controls a scanner which reads a manuscript A scan part article, While it constitutes from a carriage part article and stepping motor parts, it constitutes as independent parts which carry out coordination operation of each software part of each other and each carries out coordination operation, it is a scanner control system performing reading control of a manuscript.
[0017]In a scanner control system with which an invention of claim 5 was indicated to claim 4, An internal

configuration of the above-mentioned scan part article is a scanner control system consisting of a scanning class which is an abstract class with a manipulation interface from other parts, and a subclass with a common manipulation interface.
[0018]In a scanner control system with which an invention of claim 6 was indicated to claim 5, A subclass of the above-mentioned scanning class exists corresponding to each service of software which performs manuscript reading, Each subclass is a scanner control system carrying out reading control of a manuscript by sending a required message to a carriage part article according to the contents of service.
[0019]In a scanner control system indicated to either of claims 5 and 6, an invention of claim 7 is a scanner control system unifying a manipulation interface from a carriage part article to a subclass of a scanning class.
[0020]In a scanner control system with which an invention of claim 8 was indicated to claim 4, A stepping motor class in which an internal configuration of the above-mentioned stepping motor parts performs status management of a stepping motor, It is a stepping motor roll class which abstracted and had a drive system of a stepping motor, and a subclass of the above-mentioned stepping motor roll class, and is a scanner control system consisting of a class which controls a device according to a drive system of a stepping motor.
[0021]In a scanner control system indicated to claim 8, an invention of claim 9 is a scanner control system unifying a manipulation interface to a subclass of the above-mentioned stepping motor roll class.
[0022]An invention of claim 10 is the image forming device provided with a scanner control system indicated to either of claims 1 thru/or 9.
[0023]
[Embodiment of the Invention]Drawing 1 shows the image input/output device which is hardware constitutions to which the user interface system of this invention is applied. One is a processor (CPU) among a figure and it is what manages control of the whole device, The disk driver 9, the communication control part 10, the modem 5, and external I/F6 are connected with ROM2, RAM3, NVRAM4, the navigational panel 11, the panel control part 7, and the scan/print engine 12, and Engine control section 8 and the memory storage 13 under the control. Here, a program code, a font, and other static data are stored in ROM2, and RAM3 is used as the temporary memory location. NVRAM4 stores nonvolatile data and the navigational panel 11 and the panel control part 7 manage an interface with a user. A scan / print engine 12, and Engine control section 8 are portions which perform reading of a paper manuscript and printing to a transfer paper as an input output unit of image data. A lot of image data are accumulated, or it is used as the memory location of a database, the communication control part 10 is connected to the networks 20, such as Ethernet, and the memory storage 13 and the disk driver 9 enable communication with external apparatus. The modem 5 is connected with a public line, communication with external apparatus is enabled, and host I/F6 enables communication with the apparatus of the host exteriors, such as PC, using the interface of Centronics, RS-232C, etc.
[0024]Drawing 2 shows the structure of the correlation of the software built into the inside of a user interface control device, and hardware. Like a graphic display, if the inside of a user interface control device is roughly divided, it consists of four layers, the application layer, its lower layer kernel layer and its lower layer driver layer, and the lower layer hardware layer of a driver layer.
[0025](Application layer 100) The application layer 100 is a layer which forms applications, such as a copy fax printer. The application layer 100 is provided with the following.
Operation manager 101.
Document manager 102.
Service manager 103.
The device manager 104 and data **-SUMANEJA 105.

[0026]The operation manager 101 controls the navigational panel attached to a device, and performs the display of a button, the notice of the NOTI phi alert of button operation, etc. The document manager 102 is a main functional block as application which handles a document in accordance with the scenario of a copy fax printer etc. The service manager 103 is a functional block which is needed in common in the case of document handling, and performs management and execution of various services. The device manager 104 is a functional block which opts for operation of physical devices, such as a scanner plotter and a picture bus, and performs management and execution of various devices. The database manager 105 performs control of maintenance of the permanent data of the utilization history, billing data, etc. of a font, a fixed form form fax message receiving history, and a device.
[0027]The kernel layer 110 has the virtual memory 111, the execution process 112, the file system 113, the data input/output 114, and the virtual machine 115, and further the virtual machine 115, It has the execution control 116 and the mode control 117, and is usually incorporated as a kernel of OS, various devices are abstracted, and service is provided to application. The application layer 100 operates by carrying out a system call to the kernel layer 110.

[0028]The driver layer 120 is a meeting of a functional block which performs control for driving various hardwares. In the driver layer 120. It has the memory management driver 121, the process control driver 122, the file management driver 123, the network driver 124, the host driver 125, the integral-type copy driver 126, the blocking device driver 127, and the page device driver 128.
[0029]The hardware layer 130 is a set of a functional block which performs control for driving various hardwares, and is a set of the controllable resource which exists in a device. In the hardware layer 130, for example, With RAM131 and the process control driver 122 which are controlled by the memory management driver 121. With the memory storage (NVRAM) 133 and the network driver 124 which are controlled by RAM132 controlled and the file management driver 123. It comprises host interface 135 grade controlled by the network interface 134 controlled and the host driver 125. The scanner 136 controlled by the integral-type copy driver 126, the blocking device driver 127, and the page device driver 128, the picture bus 137, and the plotter 138 grade are also included.
[0030]Here, the device manager's 104 software configuration is explained. The device manager 104 consists of the plotter engine control section 104A, the plotter paper carrier control part 104B, the scanner control part 104C, the manuscript carrier control part 104D, and the memory unit control section 104E, as shown in drawing 3. Here, imaging of a plotter and the device of a fixing part are controlled by (1) plotter-engine control section 104A.
(2) Control the device about paper conveyance of a plotter by the plotter paper carrier control part 104B.
(3) Control the device in connection with reading control of a scanner by the scanner control part 104C.
(4) Control the device in connection with the transfer control of a manuscript by the manuscript carrier control part 104D.
(5) Control memory units, such as a hard disk, by the memory unit control section 104E.
[0031]The software configuration of a scanner control part is explained about (an invention of claims 1 thru/or 3), next the invention of claims 1 thru/or 3. These inventions relate to the software configuration of the scanner control part 104C in the device manager 104 of the application layer 100. Drawing 4 is a figure showing the composition. The rectangle expresses the independent software component (an object-oriented object, a software part.) with data and operation, and the line which connects between rectangles expresses the relation between these objects. . which is the notation using the unification modeling language (UML (Unified Modeling Language)) whose drawing 4 is one of the object-oriented-analysis techniques -- control of a scanner is realized by the coordination operation of these parts groups.
[0032](Operation) This system generates the substance (it is called an instance the instance as used in the field of an OBUEKUTO inclination, and henceforth) to parts, when required (it allocates on a memory), and when these instances communicate each other, it operates. Although the method of the communication and operation serves as mounting dependence, as an easy method, real-time OS is used, one task is assigned to each generated instance, and how the communication between tasks provided by real-time OS performs communication between instances can be considered. Here, as an example of operation, the control method of the book (Book) read mode of a scanner is explained. The processing to which a position is made to move a carriage is required as initial motion of a scanner. This operation is called homing. The control method of homing operation is also explained.
[0033]Drawing 5 expresses the situation of the message communication of each software part at the time of book reading. Each software part has a state in the inside, and if the message from other software parts is received, predetermined operation will be performed according to an internal state. While each software part communicates a message, a scanner is controlled by carrying out coordination operation. When the message of a book read start is transmitted from the application layer 100 of a higher rank to the scan part article C1, the scan part article C1, The carriage part article C2, the book reading part article C7, the stepping motor parts C4, and the home position sensor parts C5 are generated, and the message of a book read start is transmitted to the carriage part article C2. If a book read start message is received, the carriage part article C2 looks at an own state, and if it is in the state in which book reading is possible, it will transmit the message of execution to the book reading part article C7.
[0034]The book reading part article C7 has a control algorithm peculiar to book reading, creates the operation specification of a stepping motor required for book reading, and sends the message of a move start to the stepping motor parts C4. The stepping motor parts C4 perform drive controlling of a actual stepping motor according to the operation specification which the book reading part article C7 created. After reading of a manuscript is completed according to predetermined operation specification, the stepping motor parts C4 transmit the message of an end to the book reading part article C7. If the book reading part article C7 asks the home position sensor parts C5 about a state and the sensor turns it on after it receives an end message, it will be judged to be reading normal termination and will send the message of an end to the carriage part article C2. The carriage part article C2 can transmit the message of the end of book reading to the scan part article C1, and

can know that book reading ended application normally because the scan part article C1 notifies the end of book reading to the application layer 100.

[0035]Next, homing operation control of a carriage is explained with reference to drawing 6. When the message of a homing start is transmitted from the application layer 100 of a higher rank to the scan part article C1, the scan part article C1, The carriage part article C2, the homing parts C6, the stepping motor parts C4, and the home position sensor parts C5 are generated, and the message of a homing start is transmitted to the carriage part article C2. If a homing start message is received, the carriage part article C2 looks at an own state, and if it is in the state in which homing is possible, it will transmit the message of execution to the homing parts C6. The homing parts C6 have a control algorithm peculiar to homing operation, and send the message of a move start in self-starting areas to the stepping motor parts C4. The stepping motor parts C4 make a actual stepping motor drive in self-starting areas according to the message of the homing parts C6. If a carriage moves to a home position by the drive of stainless steel ping MOKU, a home position sensor turns on.

[0036]The home position sensor parts C5 will transmit the message of the sensor ON to the homing parts C6, if ON of a home position sensor is detected. If the sensor ON is received, the homing parts C6 will be judged to be homing normal termination, and will send the message of a stop, and the message of an end in the carriage part article C2 to the stepping motor parts C4. The carriage part article C2 can transmit the message of the end of homing to the scan part article C1, and can know that homing operation ended application normally because the scan part article C1 notifies the end of homing to the application layer 100.

[0037]As stated above, book reading control of a scanner and homing control can be carried out because each software part exchanges message communication. Although this example does not explain, in the case of the scanner which it has, a sheet through document feeder control required for sheet through reading, It has an algorithm which needs the sheet (Sheet) reading part article C8 for sheet through reading, and carries out by sending a message to the stepping motor parts C4 and the home position sensor parts C5. When a new reading system will be added from now on, it adds as a software part of the subclass of the carriage roll part C3, and influence of the software part on others can be lessened by unifying a manipulation interface, and a function can be extended easily. The difference among devices, such as a stepping motor by a model, is absorbable by change of stepping motor parts. Thus, this software part can be applied to many models, and the reusability of software and development efficiency can be raised.

[0038]The software configuration of a scanner control part is explained about (an invention of claims 4 thru/or 7), next the invention of claims 4 thru/or 7. It is related with the software configuration of the scanner control part which has these inventions as well as the invention of claims 1 thru/or 3 in the device manager 104 of the application layer 100, and drawing 7 is a figure showing the composition. A rectangle is the independent software component with data and operation the same [with drawing 4 having been shown] among a figure, The scan part article C1 (software part which receives the demand of reading and performs directions of operation to a running body one by one according to a demand), It comprises the carriage part article C2 (software part which controls a running body according to each state at the time of reading), and the stepping motor parts C4 (software part which drives a stepping motor required in order to move a running body). Control of a scanner is realized by the coordination operation of these parts groups.

[0039]Next, the operation is explained. Drawing 8 shows the time-speed of the stepping motor at the time of performing Book reading. That is, when there are directions of Book reading, drive at the high speed V1, it is made to move to this side of a reading start position, and a running body is made to stop from the usual reading speed V2 from high order application. Then, a motor is driven again and reading is started. If it passes through a reading range, counterrotation of the motor will be carried out and a running body will be returned to a position in readiness at the speed V3.

[0040]Drawing 9 shows the message communication between each part articles at the time of the above-mentioned Book reading. From high order application, the scan part article's C's1 reception of directions of a Book read start will send directions of read position movement to the carriage part article C2. Send directions of a stop improper acceleration-and-deceleration move start to the stepping motor parts C4, drive a running body at the high speed V1 from the usual reading speed V2, make it move to this side of a reading start position, it is made to stop, and movement ends the carriage part article C2. After movement is completed, the stepping motor parts C4 send the message of an end to the carriage part article C2. The carriage part article C2 will send the message of an end to the scan part article C1, if the message of an end is received. If the message of the end of a read position move is received, the scan part article C1 will be read in the carriage part article C2 next, and will send directions. The carriage part article C2 sends directions of the acceleration-and-deceleration move start which can be suspended to the stepping motor parts C4, and after it reads by moving a running body with the usual reading speed V2, it stops. After movement is completed, the stepping motor parts C4 send the message of an end to the carriage part article C2, and the carriage part article C2 sends the message of an end to the scan

part article C1. The scan part article C1 will send directions of a return to the carriage part article C2, if the message of the end of reading is received. The carriage part article C2 sends directions of a stop improper acceleration-and-deceleration move start to the stepping motor parts C4, carries out counterrotation of the motor, returns a running body to a position in readiness at the speed V3, and stops. After movement is completed, the stepping motor parts C4 send the message of an end to the carriage part article C2, and the carriage part article C2 sends the message of an end to the scan part article C1.

[0041]Next, the internal configuration of the scan part article C1 is described. Drawing 10 is a figure showing the structure by the notation using unification modeling language (UML:Unified Modeling Language) which is one of the object-oriented-analysis techniques. A rectangle expresses the class in object-oriented software among a figure, and the line between rectangles expresses the relation between classes. Here, each subclass of the initialization C11, the Book reading C12, the sheet reading C13, and the free run C14 exists as a subclass of a scanning class.

[0042]The function (service) which scanner control software provides is explained. The subclass of a scanning class exists corresponding to each service of scanner control software. That is, since how to use the carriage part article C1 according to the contents of service for each subclass by the above-mentioned subclass existing corresponding to each service of the software which performs manuscript reading is defined beforehand, That is, each subclass holds the information carried out with each service, and reading control of a manuscript is carried out by sending a message required for a carriage part article according to it. The function (service) which scanner control software provides specifically, For example, they are the contents of initialization, Book reading and there being sheet reading and a free run, among these using an initializing function after powering on at the time of preheating mode release, and moving a carriage to a position in readiness, or initializing image processing setting. The Book reading function makes it the contents to use it at the time of Book reading, to move a carriage, and to read a manuscript. The sheet reading function makes it the contents to use it at the time of reading which uses sheet through DF (manuscript feeder), to move a manuscript, and to read. A free run function is used at the time of the operation confirming by a serviceman etc., and makes it the contents to slow down by the cancel request and intermittent stop demand, and to stop during low speed movement.

[0043]Here, the control action of the scan part article at the time of Book reading is explained. When application software starts Book reading using scan control software, First, the instance of the Book reading class C12 which is a subclass of the scanning class C1 is generated, and the message of execute is sent to this instance. The instance of the Book reading class C12 sends the message of read position movement to the carriage part article C2. A carriage part article will send the message of complete to the instance of the Book reading class in a scan part article, if a carriage actually moves to a read position using stepping motor parts. After read position movement is completed, the instance of the Book reading class C12 holds the information about the operation carried out next, that is, knows it, and sends the message of reading to the carriage part article C2 according to it. The carriage part article C2 transmits the message of complete to the instance of the Book reading class C12, after ending reading. After the instance of a Book reading class sends directions of a return to the carriage part article C2 and is completed in it, it receives the message of complete.

[0044]The software configuration of a scanner control part is explained about (an invention of claims 4, 8, and 9), next the invention of claims 4, 8, and 9. Although it is a software configuration of the scanner control part 104C which has this example as well as the invention of above-mentioned claims 1 thru/or 7 in the device manager 104 of the application layer 100, It is related with the stepping motor parts C4 shown in the composition of drawing 7 as which the whole scanner control part is illustrated. Below, the stepping motor parts of this example are described. Drawing 11 is a figure showing the internal configuration of the stepping motor parts C4. Drawing 11 is a figure showing the structure by the notation using unification modeling language (UML:Unified ModelingLanguage) which is one of the object-oriented-analysis techniques. A rectangle expresses the class in object-oriented software among a figure, and the line which connects between rectangles expresses the relation between these objects. Here, each subclass of the self-starting move subclass C411, the stop improper acceleration-and-deceleration move subclass C412, and acceleration-and-deceleration move subclass [which can be stopped] C413** exists as a subclass of the stepping motor roll class C41 connected to the stepping motor class C40. Control of a stepping motor is realized by the coordination operation between these classes.

[0045]Next, the operation is explained. There are three kinds of drive systems of the stepping motor at the time of scanner control shown in the following table 1, and the case where each is used, and its feature are shown in front.

[0046]

[Table 1]

ステッピングモータの駆動方式	使用するケース	特徴
自起動移動	ホーミング中	直ちに駆動、停止できる。
加減速移動(停止不可)	リターン中 読み取り位置移動中	定速移動中に減速して停止することができない。
加減速移動(停止可能)	読み取り中	定速移動中にキャンセル要求、間欠停止要求により、減速して、停止することができる。

[0047]Self-starting movement which can perform a drive and a stop promptly although the movement speed of three kinds of drive systems is slow, If it accelerates gradually from a low speed and becomes target speed, will drive with constant speed, and there is acceleration-and-deceleration movement slowed down gradually in the case of a stop, and acceleration-and-deceleration movement, When a deactivate request is received while moving with constant speed furthermore, there are two kinds, the method (acceleration-and-deceleration movement which can be suspended) which can slow down and stop, and the method (stop improper acceleration-and-deceleration movement) which cannot be done. A self-starting drive is used when moving a running body to a position in readiness by the initializing operation of a scanner. This operation is called homing. Acceleration-and-deceleration movement which can be suspended is used for the stop corresponding to the cancel request [it is moving with constant speed] of a between, the stop corresponding to intermittent reading at the time of the Near full state generating of an image memory, and a reboot, and consumes a CPU power as compared with stop improper acceleration-and-deceleration movement. Therefore, stop improper acceleration-and-deceleration movement which seldom consumes a CPU power is used the return which only the inside of image reading performs acceleration-and-deceleration movement which can be suspended, and does not perform image reading, and during read position movement.

[0048]The software for controlling the drive of a stepping motor by these drive systems is constituted inside the stepping motor parts C4 (refer to drawing 7). This is constituted by the subclass of the stepping motor roll class C41 connected to the stepping motor class C40 as the self-starting movement C411, the stop improper acceleration-and-deceleration movement C412, and the acceleration-and-deceleration movement C413 that can be suspended. Below, operation of the motor drive control system constituted by these parts is explained. This system is put into operation by sending a movement directive message to the stepping motor parts C4. The directions are sent as a movement directive message according to the drive system of the stepping motor from the scan part article C1, as shown in operation of above-mentioned drawing 9. That is, in the example of BOOK reading, stop improper acceleration-and-deceleration movement is sent as a movement directive message during stop improper acceleration-and-deceleration movement and reading during read position movement into acceleration-and-deceleration movement which can be suspended, and a return.

[0049]The stepping motor class C40 receives these directions, According to an instruction content, acceleration-and-deceleration move the required self-starting move class C411 which is a subclass of the stepping motor roll class C41, the stop improper acceleration-and-deceleration move class C412, or the class which can be stopped C413 is connected via operation of the stepping motor roll class C41. As opposed to the subclass of the stepping motor roll class C41 which connected the stepping motor class C40, The operation parameters (for example, it asks based on the velocity diagram of drawing 8, and prepared beforehand) for driving a stepping motor are set up, and feed movement is carried out for the prompting message of a drive start. After a drive is completed, the subclass of this stepping motor roll class C41 tells the stepping motor class C40 about operation finish by an end message. The stepping motor class C40 which received this notifies an operation finish message to the scan part article C1.

[0050]The stepping motor class C40 directs setting out of operation parameters, a drive start, a stop, etc., after connecting one subclass of the stepping motor roll classes C41 according to directions of operation, but it unifies the manipulation interface of these directions. Thereby, after subclass connection of the stepping motor roll class C41 is not based on the kind of subclass, but is the same operating procedure and can perform setting out of the operation parameters of a stepping motor, and directions of a drive start. Therefore, when the drive system of a stepping motor different from now on is added, the subclass of a stepping motor roll class can newly be added, and new drive controlling can be performed only by connecting the subclass. Connection can be canceled without performing the other processing only by deleting the subclass of an unnecessary stepping motor roll class depending on the model, when there is an unnecessary drive system. Thus, scanner control and drive controlling of a stepping motor can be carried out because each software part exchanges message communication. a model

-- **** for subclasses of a required stepping motor roll class -- by things, this software part can be applied to many models, and the reusability of software and development efficiency can be raised.
[0051]As stated above, service of scanner control software is carried out because each software part carries out coordination operation. When adding new service to scan control software, it is adding the subclass of a new scanning class, and extension of a function can be performed. When there is unnecessary service, the subclass of an unnecessary scanning class deletes and it can avoid using it depending on the model. By unifying into complete the manipulation interface in which it is shown that the operation specified from the carriage part article to the subclass of the scanning class was completed, even when the subclass of a scanning class is newly added, it is not necessary to change the contents of the carriage part article. The function of the above-mentioned control system is realizable in an image forming device by equipping an image forming device with the scanner control system explained above.
[0052]
[Effect of the Invention]The effect corresponding to claim 1 : The software part which receives a read request for the composition of the software which performs scanner control, The software part which manages the running body which reads, and a carriage roll part, It constitutes from a software part which controls directly each device, such as a sensor required for reading control, and a stepping motor, By performing reading control of a scanner, while each software part is constituted as independent parts which carry out emphasis operation mutually and each carries out emphasis operation. This software part can be applied to many models, and extension of a scanner control function can be made easy, and software development efficiency can be raised.
The effect corresponding to claim 2 : with constituting from a software part which makes a carriage roll part an abstract class and controls the carriage according to a scan request as a subclass of a carriage roll part. When adding a function to a scanner newly, expansion can be possible by adding the subclass of a carriage roll part, and the extendibility of scanner control software can be raised.
The effect corresponding to claim 3 : by making it the same, the manipulation interface of a carriage roll part and the software part of the subclass. The manipulation interface at the time of adding a new function to the subclass of a carriage roll part can be made the same, expansion of scanner control software can be made easy, and the reliability of software can be raised.
[0053]The effect corresponding to claim 4 : The software system which performs scanner control in an image forming device A scan part article, Because it was made to perform reading control of the scanner while it constituted from a carriage part article and stepping motor parts, it constituted as independent parts which carry out coordination operation of each software part of each other and each carried out coordination operation. This software system can be applied to many models, and extension of a scanner control function can be made easy, and software development efficiency can be raised.
Effect corresponding to claim 5: The composition of the software which performs scanner control Scan part article, The abstract class (scanning class) which consisted of a carriage part article and stepping motor parts, and had a manipulation interface from other parts for the internal configuration of a scan part article, By performing reading control of a scanner, while it constitutes from a subclass with a common manipulation interface, it constitutes as independent parts which carry out coordination operation of each software part of each other and each carries out coordination operation. The addition of the control system of a scanner is carried out, a change can be made easy, and software development efficiency can be raised.
Effect corresponding to claim 6: The abstract class (scanning class) which had a manipulation interface from other parts for the composition of the software part which receives the demand of reading and performs directions of operation to a running body one by one according to a demand, Constitute from a subclass with a common manipulation interface, and the subclass of the above-mentioned scanning class, It existed corresponding to each service of software which performs manuscript reading, and each subclass holds the information on how to use the carriage part article according to the contents of service, and knows the jam, and reading control of a manuscript is carried out by sending the required message to a carriage part article. Therefore, the addition of the function (service) of scanner control software is carried out, a change can be made easy, and software development efficiency can be raised.
Effect corresponding to claim 7: By the thing which unify the manipulation interface from the above-mentioned carriage part article to the subclass of a scanning class and for which things are done. The changing amount of other software parts can be lessened at the time of an addition and change of the function (service) of scanner control software, and the reliability of a software part can be raised.
[0054]Effect corresponding to claim 8: The class which performs status management of a stepping motor for the internal configuration of the software part which drives a stepping motor, By the abstract class with the role which a stepping motor drives, and the subclass of the above-mentioned stepping motor roll class. By constituting from a class which controls a device according to the drive system of a stepping motor, the addition

of the drive system of a stepping motor is carried out, a change can be made easy, and software development efficiency can be raised.

Effect corresponding to claim 9: By unifying the manipulation interface to the subclass of a stepping motor roll class, an addition is carried out, and a change of a motor driving system can be made easy, and the reliability of a software part can be raised.

The effect corresponding to claim 10: Since it has the scanner which can do expansion easily, the image forming device suitable for the user's needs is easily realizable.

[Translation done.]

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TECHNICAL FIELD

[Field of the Invention]The parts-ized software is used in this invention.
Therefore, while making expansion easy, it is related with the image forming device provided with the scanner control system which raised the development efficiency of software, and this scanner control system.

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PRIOR ART

[Description of the Prior Art]In recent years, in response to a performance rise and low-cost-izing of computer hardware, increase of the scale of software and complication of the problem used as the object are increasing every year. On the other hand, the development cycle of these software goods or the goods of the apparatus incorporating software tends to be shortened every year. In the software industry, the improvement of the development efficiency serves as an inevitable demand in such environment. Part-ization of software can be considered as the one solution. This tends to intend to constitute a software system with two or more independent components (software part), and to reuse by other systems in the component unit. Thereby, long-term software development efficiency is improvable inside. About the automatic generation method of a software part. For example, "program automatic generation by a data center type software part" (JP,5-108319,A), A "program generation system" (JP,9-204301,A), a "software automatic generation device" (JP,10-240514,A), The proposal of "the object-oriented-development method of a control device" (JP,8-185424,A), etc. again the thing about a software part for example, Although a "software part reuse method" (JP,6-250,A), a "software part device" (JP,7-141,A), etc. are exhibited, about the part-ized method for control of a scanner, it has not been proposed yet.

[Translation done.]

EFFECT OF THE INVENTION

[Effect of the Invention]The effect corresponding to claim 1 : The software part which receives a read request for the composition of the software which performs scanner control, The software part which manages the running body which reads, and a carriage roll part, It constitutes from a software part which controls directly each device, such as a sensor required for reading control, and a stepping motor, By performing reading control of a scanner, while each software part is constituted as independent parts which carry out emphasis operation mutually and each carries out emphasis operation. This software part can be applied to many models, and extension of a scanner control function can be made easy, and software development efficiency can be raised.
The effect corresponding to claim 2 : with constituting from a software part which makes a carriage roll part an abstract class and controls the carriage according to a scan request as a subclass of a carriage roll part. When adding a function to a scanner newly, expansion can be possible by adding the subclass of a carriage roll part, and the extendibility of scanner control software can be raised.
The effect corresponding to claim 3 : by making it the same, the manipulation interface of a carriage roll part and the software part of the subclass. The manipulation interface at the time of adding a new function to the subclass of a carriage roll part can be made the same, expansion of scanner control software can be made easy, and the reliability of software can be raised.
[0053]The effect corresponding to claim 4 : The software system which performs scanner control in an image forming device A scan part article, Because it was made to perform reading control of the scanner while it constituted from a carriage part article and stepping motor parts, it constituted as independent parts which carry out coordination operation of each software part of each other and each carried out coordination operation. This software system can be applied to many models, and extension of a scanner control function can be made easy, and software development efficiency can be raised.
Effect corresponding to claim 5: The composition of the software which performs scanner control Scan part article, The abstract class (scanning class) which consisted of a carriage part article and stepping motor parts, and had a manipulation interface from other parts for the internal configuration of a scan part article, By performing reading control of a scanner, while it constitutes from a subclass with a common manipulation interface, it constitutes as independent parts which carry out coordination operation of each software part of each other and each carries out coordination operation. The addition of the control system of a scanner is carried out, a change can be made easy, and software development efficiency can be raised.
Effect corresponding to claim 6: The abstract class (scanning class) which had a manipulation interface from other parts for the composition of the software part which receives the demand of reading and performs directions of operation to a running body one by one according to a demand, Constitute from a subclass with a common manipulation interface, and the subclass of the above-mentioned scanning class, It existed corresponding to each service of software which performs manuscript reading, and each subclass holds the information on how to use the carriage part article according to the contents of service, and knows the jam, and reading control of a manuscript is carried out by sending the required message to a carriage part article. Therefore, the addition of the function (service) of scanner control software is carried out, a change can be made easy, and software development efficiency can be raised.
Effect corresponding to claim 7: By the thing which unify the manipulation interface from the above-mentioned carriage part article to the subclass of a scanning class and for which things are done. The changing amount of other software parts can be lessened at the time of an addition and change of the function (service) of scanner control software, and the reliability of a software part can be raised.
[0054]Effect corresponding to claim 8: The class which performs status management of a stepping motor for the internal configuration of the software part which drives a stepping motor, By the abstract class with the role which a stepping motor drives, and the subclass of the above-mentioned stepping motor roll class. By constituting from a class which controls a device according to the drive system of a stepping motor, the addition

of the drive system of a stepping motor is carried out, a change can be made easy, and software development efficiency can be raised.

Effect corresponding to claim 9: By unifying the manipulation interface to the subclass of a stepping motor roll class, an addition is carried out, and a change of a motor driving system can be made easy, and the reliability of a software part can be raised.

The effect corresponding to claim 10: Since it has the scanner which can do expansion easily, the image forming device suitable for the user's needs is easily realizable.

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TECHNICAL PROBLEM

[Problem(s) to be Solved by the Invention]In the software system which controls the scanner which reads a manuscript, the technical problem of this invention is in raising the reusability of software by performing part-ization peculiar to the field (here scanner). The purpose of an invention of claim 1 a read request specifically for the composition of the software which controls the scanner which reads a manuscript A ****** software part, The software part which manages the running body which reads, and the software part which controls the running body according to various read requests, It constitutes from a software part which controls directly each device, such as a sensor required for reading control, and a stepping motor, By performing reading control of a scanner, while each software part is constituted as independent parts which carry out coordination operation mutually and each carries out coordination operation. It is applying this software part to many models, and making extension of a scanner control function easy, and raising software development efficiency.
[0004]The purpose of an invention of claim 2 is to make extension of the function of a scanner easy by making a carriage roll part into an abstract class, constituting, that is, making it a layered structure with the software part which controls the carriage [subclass / of a carriage roll part] according to a scan request.
[0005]The purpose of an invention of claim 3 is to make the same the manipulation interface of a carriage roll part and the software part of the subclass, and is making expansion of a scanner easy and raising the reliability of software.
[0006]The software part (it is called a scan part article.) which the purpose of an invention of claim 4 receives the demand of reading for the composition of the software which performs scanner control, and performs directions of operation to a running body according to a demand, The software part (it is called a carriage part article.) which controls a running body according to each state at the time of reading, It constitutes from a software part (it is called stepping motor parts.) which drives a stepping motor required in order to move a running body, By performing reading control of a scanner, while each software part is constituted as independent parts which carry out coordination operation mutually and each carries out coordination operation. It is applying this software part to many models, and making extension of a scanner control function easy, and raising software development efficiency.
[0007]The purpose of an invention of claim 5 the composition of the software which performs scanner control A scan part article, The abstract class (it is called a scanning class.) which consisted of a carriage part article and stepping motor parts, and had a manipulation interface from other parts for the internal configuration of a scan part article, By performing reading control of a scanner, while it constitutes from a subclass with a common manipulation interface, it constitutes as independent parts which carry out coordination operation of each software part of each other and each carries out coordination operation. It is carrying out the addition of the control system of a scanner, making a change easy, and raising software development efficiency.
[0008]Abstract class, i.e., scanning class, which had a manipulation interface from other parts for the composition of the scan part article which the purpose of an invention of claim 6 receives the demand of reading, and performs directions of operation to a running body one by one according to a demand, Constitute from a subclass with a common manipulation interface, and the subclass of the above-mentioned scanning class, . Existed corresponding to each service of the software which performs manuscript reading, and each subclass embraced the contents of service. It is holding the information on usage **** of a carriage part article, that is, knowing, carrying out reading control of a manuscript by sending the required message to a carriage part article, carrying out the addition of the function (service) of scanner control software, making a change easy, and raising software development efficiency.
[0009]The purpose of an invention of claim 7 is a thing which unify the manipulation interface from the above-mentioned carriage part article to the subclass of a scanning class and for which things are done, It is lessening the changing amount of other software parts at the time of an addition and change of the function (service) of scanner control software, and raising the reliability of a software part.

[0010]The class from which the purpose of an invention of claim 8 constitutes the software part which drives a stepping motor for the status management of a stepping motor, By the abstract class with the role which drives a stepping motor, and the subclass of the above-mentioned stepping motor roll class. With constituting from a class which controls a device according to the drive system of a stepping motor, the addition of the drive system of a stepping motor is carried out, a change is made easy, and it aims at raising software development efficiency.
[0011]The purpose of an invention of claim 9 is to unify the manipulation interface to the subclass of the above-mentioned stepping motor roll class, and is carrying out an addition, and making a change of a motor driving system easy, and raising the reliability of a software part.
[0012]The purpose of an invention of claim 10 is to provide the image forming device provided with the scanner system indicated to either of claims 1 thru/or 9.

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MEANS

[Means for Solving the Problem]An external-interface part with which this invention receives image data, for example from an external system, In an image forming device which has a delivery bottle part for distributing and placing a recorder which saves a picture, a plotter section which prints a picture on a paper, a scanner part which reads a picture, and a printed paper, etc., Software which controls a scanner which reads a manuscript is constituted by two or more independent parts, As a scanner control system has a mechanism in which it operates by coordination operation of these parts, an invention of claim 1, A software part which receives a read request constituted considering composition of software which controls a scanner which reads a manuscript as parts which became independent respectively, A software part which manages a running body which reads, and a software part which controls a running body according to various read requests, While it constitutes from a software part which controls directly each device, such as a sensor required for reading control, and a stepping motor, and each software part carries out coordination operation mutually, it is a scanner control system performing reading control of a manuscript.
[0014]In a scanner control system with which an invention of claim 2 was indicated to claim 1, the above -- it is a scanner control system having made into an abstract class a software part which controls a running body according to various read requests, and constituting a subclass of this software part from a software part which operates a carriage.
[0015]In a scanner control system with which an invention of claim 3 was indicated to claim 2, the above -- it is a scanner control system using as the same manipulation interface a software part which controls a running body according to various read requests, and a software part of a subclass of this software part.
[0016]An invention of claim 4 composition of software which controls a scanner which reads a manuscript A scan part article, While it constitutes from a carriage part article and stepping motor parts, it constitutes as independent parts which carry out coordination operation of each software part of each other and each carries out coordination operation, it is a scanner control system performing reading control of a manuscript.
[0017]In a scanner control system with which an invention of claim 5 was indicated to claim 4, An internal configuration of the above-mentioned scan part article is a scanner control system consisting of a scanning class which is an abstract class with a manipulation interface from other parts, and a subclass with a common manipulation interface.
[0018]In a scanner control system with which an invention of claim 6 was indicated to claim 5, A subclass of the above-mentioned scanning class exists corresponding to each service of software which performs manuscript reading, Each subclass is a scanner control system carrying out reading control of a manuscript by sending a required message to a carriage part article according to the contents of service.
[0019]In a scanner control system indicated to either of claims 5 and 6, an invention of claim 7 is a scanner control system unifying a manipulation interface from a carriage part article to a subclass of a scanning class.
[0020]In a scanner control system with which an invention of claim 8 was indicated to claim 4, A stepping motor class in which an internal configuration of the above-mentioned stepping motor parts performs status management of a stepping motor, It is a stepping motor roll class which abstracted and had a drive system of a stepping motor, and a subclass of the above-mentioned stepping motor roll class, and is a scanner control system consisting of a class which controls a device according to a drive system of a stepping motor.
[0021]In a scanner control system indicated to claim 8, an invention of claim 9 is a scanner control system unifying a manipulation interface to a subclass of the above-mentioned stepping motor roll class.
[0022]An invention of claim 10 is the image forming device provided with a scanner control system indicated to either of claims 1 thru/or 9.
[0023]
[Embodiment of the Invention]Drawing 1 shows the image input/output device which is hardware constitutions to which the user interface system of this invention is applied. One is a processor (CPU) among a figure and it is

what manages control of the whole device, The disk driver 9, the communication control part 10, the modem 5, and external I/F6 are connected with ROM2, RAM3, NVRAM4, the navigational panel 11, the panel control part 7, and the scan/print engine 12, and Engine control section 8 and the memory storage 13 under the control. Here, a program code, a font, and other static data are stored in ROM2, and RAM3 is used as the temporary memory location. NVRAM4 stores nonvolatile data and the navigational panel 11 and the panel control part 7 manage an interface with a user. A scan / print engine 12, and Engine control section 8 are portions which perform reading of a paper manuscript and printing to a transfer paper as an input output unit of image data. A lot of image data are accumulated, or it is used as the memory location of a database, the communication control part 10 is connected to the networks 20, such as Ethernet, and the memory storage 13 and the disk driver 9 enable communication with external apparatus. The modem 5 is connected with a public line, communication with external apparatus is enabled, and host I/F6 enables communication with the apparatus of the host exteriors, such as PC, using the interface of Centronics, RS-232C, etc.

[0024]Drawing 2 shows the structure of the correlation of the software built into the inside of a user interface control device, and hardware. Like a graphic display, if the inside of a user interface control device is roughly divided, it consists of four layers, the application layer, its lower layer kernel layer and its lower layer driver layer, and the lower layer hardware layer of a driver layer.

[0025](Application layer 100) The application layer 100 is a layer which forms applications, such as a copy fax printer. The application layer 100 is provided with the following.

Operation manager 101.

Document manager 102.

Service manager 103.

The device manager 104 and data **-SUMANEJA 105.

[0026]The operation manager 101 controls the navigational panel attached to a device, and performs the display of a button, the notice of the NOTI phi alert of button operation, etc. The document manager 102 is a main functional block as application which handles a document in accordance with the scenario of a copy fax printer etc. The service manager 103 is a functional block which is needed in common in the case of document handling, and performs management and execution of various services. The device manager 104 is a functional block which opts for operation of physical devices, such as a scanner plotter and a picture bus, and performs management and execution of various devices. The database manager 105 performs control of maintenance of the permanent data of the utilization history, billing data, etc. of a font, a fixed form form fax message receiving history, and a device.

[0027]The kernel layer 110 has the virtual memory 111, the execution process 112, the file system 113, the data input/output 114, and the virtual machine 115, and further the virtual machine 115, It has the execution control 116 and the mode control 117, and is usually incorporated as a kernel of OS, various devices are abstracted, and service is provided to application. The application layer 100 operates by carrying out a system call to the kernel layer 110.

[0028]The driver layer 120 is a meeting of a functional block which performs control for driving various hardwares. In the driver layer 120. It has the memory management driver 121, the process control driver 122, the file management driver 123, the network driver 124, the host driver 125, the integral-type copy driver 126, the blocking device driver 127, and the page device driver 128.

[0029]The hardware layer 130 is a set of a functional block which performs control for driving various hardwares, and is a set of the controllable resource which exists in a device. In the hardware layer 130, for example, With RAM131 and the process control driver 122 which are controlled by the memory management driver 121. With the memory storage (NVRAM) 133 and the network driver 124 which are controlled by RAM132 controlled and the file management driver 123. It comprises host interface 135 grade controlled by the network interface 134 controlled and the host driver 125. The scanner 136 controlled by the integral-type copy driver 126, the blocking device driver 127, and the page device driver 128, the picture bus 137, and the plotter 138 grade are also included.

[0030]Here, the device manager's 104 software configuration is explained. The device manager 104 consists of the plotter engine control section 104A, the plotter paper carrier control part 104B, the scanner control part 104C, the manuscript carrier control part 104D, and the memory unit control section 104E, as shown in drawing 3. Here, imaging of a plotter and the device of a fixing part are controlled by (1) plotter-engine control section 104A.

(2) Control the device about paper conveyance of a plotter by the plotter paper carrier control part 104B.

(3) Control the device in connection with reading control of a scanner by the scanner control part 104C.

(4) Control the device in connection with the transfer control of a manuscript by the manuscript carrier control part 104D.

(5) Control memory units, such as a hard disk, by the memory unit control section 104E.
[0031]The software configuration of a scanner control part is explained about (an invention of claims 1 thru/or 3), next the invention of claims 1 thru/or 3. These inventions relate to the software configuration of the scanner control part 104C in the device manager 104 of the application layer 100. Drawing 4 is a figure showing the composition. The rectangle expresses the independent software component (an object-oriented object, a software part.) with data and operation, and the line which connects between rectangles expresses the relation between these objects. . which is the notation using the unification modeling language (UML (Unified Modeling Language)) whose drawing 4 is one of the object-oriented-analysis techniques -- control of a scanner is realized by the coordination operation of these parts groups.
[0032](Operation) This system generates the substance (it is called an instance the instance as used in the field of an OBUEKUTO inclination, and henceforth) to parts, when required (it allocates on a memory), and when these instances communicate each other, it operates. Although the method of the communication and operation serves as mounting dependence, as an easy method, real-time OS is used, one task is assigned to each generated instance, and how the communication between tasks provided by real-time OS performs communication between instances can be considered. Here, as an example of operation, the control method of the book (Book) read mode of a scanner is explained. The processing to which a position is made to move a carriage is required as initial motion of a scanner. This operation is called homing. The control method of homing operation is also explained.
[0033]Drawing 5 expresses the situation of the message communication of each software part at the time of book reading. Each software part has a state in the inside, and if the message from other software parts is received, predetermined operation will be performed according to an internal state. While each software part communicates a message, a scanner is controlled by carrying out coordination operation. When the message of a book read start is transmitted from the application layer 100 of a higher rank to the scan part article C1, the scan part article C1, The carriage part article C2, the book reading part article C7, the stepping motor parts C4, and the home position sensor parts C5 are generated, and the message of a book read start is transmitted to the carriage part article C2. If a book read start message is received, the carriage part article C2 looks at an own state, and if it is in the state in which book reading is possible, it will transmit the message of execution to the book reading part article C7.
[0034]The book reading part article C7 has a control algorithm peculiar to book reading, creates the operation specification of a stepping motor required for book reading, and sends the message of a move start to the stepping motor parts C4. The stepping motor parts C4 perform drive controlling of a actual stepping motor according to the operation specification which the book reading part article C7 created. After reading of a manuscript is completed according to predetermined operation specification, the stepping motor parts C4 transmit the message of an end to the book reading part article C7. If the book reading part article C7 asks the home position sensor parts C5 about a state and the sensor turns it on after it receives an end message, it will be judged to be reading normal termination and will send the message of an end to the carriage part article C2. The carriage part article C2 can transmit the message of the end of book reading to the scan part article C1, and can know that book reading ended application normally because the scan part article C1 notifies the end of book reading to the application layer 100.
[0035]Next, homing operation control of a carriage is explained with reference to drawing 6. When the message of a homing start is transmitted from the application layer 100 of a higher rank to the scan part article C1, the scan part article C1, The carriage part article C2, the homing parts C6, the stepping motor parts C4, and the home position sensor parts C5 are generated, and the message of a homing start is transmitted to the carriage part article C2. If a homing start message is received, the carriage part article C2 looks at an own state, and if it is in the state in which homing is possible, it will transmit the message of execution to the homing parts C6. The homing parts C6 have a control algorithm peculiar to homing operation, and send the message of a move start in self-starting areas to the stepping motor parts C4. The stepping motor parts C4 make a actual stepping motor drive in self-starting areas according to the message of the homing parts C6. If a carriage moves to a home position by the drive of stainless steel ping MOKU, a home position sensor turns on.
[0036]The home position sensor parts C5 will transmit the message of the sensor 0N to the homing parts C6, if ON of a home position sensor is detected. If the sensor ON is received, the homing parts C6 will be judged to be homing normal termination, and will send the message of a stop, and the message of an end in the carriage part article C2 to the stepping motor parts C4. The carriage part article C2 can transmit the message of the end of homing to the scan part article C1, and can know that homing operation ended application normally because the scan part article C1 notifies the end of homing to the application layer 100.
[0037]As stated above, book reading control of a scanner and homing control can be carried out because each software part exchanges message communication. Although this example does not explain, in the case of the scanner which it has, a sheet through document feeder control required for sheet through reading, It has an

algorithm which needs the sheet (Sheet) reading part article C8 for sheet through reading, and carries out by sending a message to the stepping motor parts C4 and the home position sensor parts C5. When a new reading system will be added from now on, it adds as a software part of the subclass of the carriage roll part C3, and influence of the software part on others can be lessened by unifying a manipulation interface, and a function can be extended easily. The difference among devices, such as a stepping motor by a model, is absorbable by change of stepping motor parts. Thus, this software part can be applied to many models, and the reusability of software and development efficiency can be raised.

[0038]The software configuration of a scanner control part is explained about (an invention of claims 4 thru/or 7), next the invention of claims 4 thru/or 7. It is related with the software configuration of the scanner control part which has these inventions as well as the invention of claims 1 thru/or 3 in the device manager 104 of the application layer 100, and drawing 7 is a figure showing the composition. A rectangle is the independent software component with data and operation the same [with drawing 4 having been shown] among a figure, The scan part article C1 (software part which receives the demand of reading and performs directions of operation to a running body one by one according to a demand), It comprises the carriage part article C2 (software part which controls a running body according to each state at the time of reading), and the stepping motor parts C4 (software part which drives a stepping motor required in order to move a running body). Control of a scanner is realized by the coordination operation of these parts groups.

[0039]Next, the operation is explained. Drawing 8 shows the time-speed of the stepping motor at the time of performing Book reading. That is, when there are directions of Book reading, drive at the high speed V1, it is made to move to this side of a reading start position, and a running body is made to stop from the usual reading speed V2 from high order application. Then, a motor is driven again and reading is started. If it passes through a reading range, counterrotation of the motor will be carried out and a running body will be returned to a position in readiness at the speed V3.

[0040]Drawing 9 shows the message communication between each part articles at the time of the above-mentioned Book reading. From high order application, the scan part article's C's1 reception of directions of a Book read start will send directions of read position movement to the carriage part article C2. Send directions of a stop improper acceleration-and-deceleration move start to the stepping motor parts C4, drive a running body at the high speed V1 from the usual reading speed V2, make it move to this side of a reading start position, it is made to stop, and movement ends the carriage part article C2. After movement is completed, the stepping motor parts C4 send the message of an end to the carriage part article C2. The carriage part article C2 will send the message of an end to the scan part article C1, if the message of an end is received. If the message of the end of a read position move is received, the scan part article C1 will be read in the carriage part article C2 next, and will send directions. The carriage part article C2 sends directions of the acceleration-and-deceleration move start which can be suspended to the stepping motor parts C4, and after it reads by moving a running body with the usual reading speed V2, it stops. After movement is completed, the stepping motor parts C4 send the message of an end to the carriage part article C2, and the carriage part article C2 sends the message of an end to the scan part article C1. The scan part article C1 will send directions of a return to the carriage part article C2, if the message of the end of reading is received. The carriage part article C2 sends directions of a stop improper acceleration-and-deceleration move start to the stepping motor parts C4, carries out counterrotation of the motor, returns a running body to a position in readiness at the speed V3, and stops. After movement is completed, the stepping motor parts C4 send the message of an end to the carriage part article C2, and the carriage part article C2 sends the message of an end to the scan part article C1.

[0041]Next, the internal configuration of the scan part article C1 is described. Drawing 10 is a figure showing the structure by the notation using unification modeling language (UML:Unified Modeling Language) which is one of the object-oriented-analysis techniques. A rectangle expresses the class in object-oriented software among a figure, and the line between rectangles expresses the relation between classes. Here, each subclass of the initialization C11, the Book reading C12, the sheet reading C13, and the free run C14 exists as a subclass of a scanning class.

[0042]The function (service) which scanner control software provides is explained. The subclass of a scanning class exists corresponding to each service of scanner control software. That is, since how to use the carriage part article C1 according to the contents of service for each subclass by the above-mentioned subclass existing corresponding to each service of the software which performs manuscript reading is defined beforehand, That is, each subclass holds the information carried out with each service, and reading control of a manuscript is carried out by sending a message required for a carriage part article according to it. The function (service) which scanner control software provides specifically, For example, they are the contents of initialization, Book reading and there being sheet reading and a free run, among these using an initializing function after powering on at the time of preheating mode release, and moving a carriage to a position in readiness, or initializing image processing

setting. The Book reading function makes it the contents to use it at the time of Book reading, to move a carriage, and to read a manuscript. The sheet reading function makes it the contents to use it at the time of reading which uses sheet through DF (manuscript feeder), to move a manuscript, and to read. A free run function is used at the time of the operation confirming by a serviceman etc., and makes it the contents to slow down by the cancel request and intermittent stop demand, and to stop during low speed movement.

[0043]Here, the control action of the scan part article at the time of Book reading is explained. When application software starts Book reading using scan control software, First, the instance of the Book reading class C12 which is a subclass of the scanning class C1 is generated, and the message of execute is sent to this instance. The instance of the Book reading class C12 sends the message of read position movement to the carriage part article C2. A carriage part article will send the message of complete to the instance of the Book reading class in a scan part article, if a carriage actually moves to a read position using stepping motor parts. After read position movement is completed, the instance of the Book reading class C12 holds the information about the operation carried out next, that is, knows it, and sends the message of reading to the carriage part article C2 according to it. The carriage part article C2 transmits the message of complete to the instance of the Book reading class C12, after ending reading. After the instance of a Book reading class sends directions of a return to the carriage part article C2 and is completed in it, it receives the message of complete.

[0044]The software configuration of a scanner control part is explained about (an invention of claims 4, 8, and 9), next the invention of claims 4, 8, and 9. Although it is a software configuration of the scanner control part 104C which has this example as well as the invention of above-mentioned claims 1 thru/or 7 in the device manager 104 of the application layer 100, It is related with the stepping motor parts C4 shown in the composition of drawing 7 as which the whole scanner control part is illustrated. Below, the stepping motor parts of this example are described. Drawing 11 is a figure showing the internal configuration of the stepping motor parts C4. Drawing 11 is a figure showing the structure by the notation using unification modeling language (UML:Unified ModelingLanguage) which is one of the object-oriented-analysis techniques. A rectangle expresses the class in object-oriented software among a figure, and the line which connects between rectangles expresses the relation between these objects. Here, each subclass of the self-starting move subclass C411, the stop improper acceleration-and-deceleration move subclass C412, and acceleration-and-deceleration move subclass [which can be stopped] C413** exists as a subclass of the stepping motor roll class C41 connected to the stepping motor class C40. Control of a stepping motor is realized by the coordination operation between these classes.

[0045]Next, the operation is explained. There are three kinds of drive systems of the stepping motor at the time of scanner control shown in the following table 1, and the case where each is used, and its feature are shown in front.

[0046]

[Table 1]

ステッピングモータの駆動方式	使用するケース	特徴
自起動移動	ホーミング中	直ちに駆動、停止できる。
加減速移動(停止不可)	リターン中 読み取り位置移動中	定速移動中に減速して停止することができない。
加減速移動(停止可能)	読み取り中	定速移動中にキャンセル要求、間欠停止要求により、減速して、停止することができる。

[0047]Self-starting movement which can perform a drive and a stop promptly although the movement speed of three kinds of drive systems is slow, If it accelerates gradually from a low speed and becomes target speed, will drive with constant speed, and there is acceleration-and-deceleration movement slowed down gradually in the case of a stop, and acceleration-and-deceleration movement, When a deactivate request is received while moving with constant speed furthermore, there are two kinds, the method (acceleration-and-deceleration movement which can be suspended) which can slow down and stop, and the method (stop improper acceleration-and-deceleration movement) which cannot be done. A self-starting drive is used when moving a running body to a position in readiness by the initializing operation of a scanner. This operation is called homing. Acceleration-and-deceleration movement which can be suspended is used for the stop corresponding to the cancel request [it is moving with constant speed] of a between, the stop corresponding to intermittent reading at the time of the Near full state generating of an image memory, and a reboot, and consumes a CPU power as compared with stop improper acceleration-and-deceleration movement. Therefore, stop improper acceleration-and-deceleration

movement which seldom consumes a CPU power is used the return which only the inside of image reading performs acceleration-and-deceleration movement which can be suspended, and does not perform image reading, and during read position movement.

[0048]The software for controlling the drive of a stepping motor by these drive systems is constituted inside the stepping motor parts C4 (refer to drawing 7). This is constituted by the subclass of the stepping motor roll class C41 connected to the stepping motor class C40 as the self-starting movement C411, the stop improper acceleration-and-deceleration movement C412, and the acceleration-and-deceleration movement C413 that can be suspended. Below, operation of the motor drive control system constituted by these parts is explained. This system is put into operation by sending a movement directive message to the stepping motor parts C4. The directions are sent as a movement directive message according to the drive system of the stepping motor from the scan part article C1, as shown in operation of above-mentioned drawing 9. That is, in the example of BOOK reading, stop improper acceleration-and-deceleration movement is sent as a movement directive message during stop improper acceleration-and-deceleration movement and reading during read position movement into acceleration-and-deceleration movement which can be suspended, and a return.

[0049]The stepping motor class C40 receives these directions, According to an instruction content, acceleration-and-deceleration move the required self-starting move class C411 which is a subclass of the stepping motor roll class C41, the stop improper acceleration-and-deceleration move class C412, or the class which can be stopped C413 is connected via operation of the stepping motor roll class C41. As opposed to the subclass of the stepping motor roll class C41 which connected the stepping motor class C40, The operation parameters (for example, it asks based on the velocity diagram of drawing 8, and prepared beforehand) for driving a stepping motor are set up, and feed movement is carried out for the prompting message of a drive start. After a drive is completed, the subclass of this stepping motor roll class C41 tells the stepping motor class C40 about operation finish by an end message. The stepping motor class C40 which received this notifies an operation finish message to the scan part article C1.

[0050]The stepping motor class C40 directs setting out of operation parameters, a drive start, a stop, etc., after connecting one subclass of the stepping motor roll classes C41 according to directions of operation, but it unifies the manipulation interface of these directions. Thereby, after subclass connection of the stepping motor roll class C41 is not based on the kind of subclass, but is the same operating procedure and can perform setting out of the operation parameters of a stepping motor, and directions of a drive start. Therefore, when the drive system of a stepping motor different from now on is added, the subclass of a stepping motor roll class can newly be added, and new drive controlling can be performed only by connecting the subclass. Connection can be canceled without performing the other processing only by deleting the subclass of an unnecessary stepping motor roll class depending on the model, when there is an unnecessary drive system. Thus, scanner control and drive controlling of a stepping motor can be carried out because each software part exchanges message communication. a model -- **** for subclasses of a required stepping motor roll class -- by things, this software part can be applied to many models, and the reusability of software and development efficiency can be raised.

[0051]As stated above, service of scanner control software is carried out because each software part carries out coordination operation. When adding new service to scan control software, it is adding the subclass of a new scanning class, and extension of a function can be performed. When there is unnecessary service, the subclass of an unnecessary scanning class deletes and it can avoid using it depending on the model. By unifying into complete the manipulation interface in which it is shown that the operation specified from the carriage part article to the subclass of the scanning class was completed, even when the subclass of a scanning class is newly added, it is not necessary to change the contents of the carriage part article. The function of the above-mentioned control system is realizable in an image forming device by equipping an image forming device with the scanner control system explained above.

[Translation done.]

DESCRIPTION OF DRAWINGS

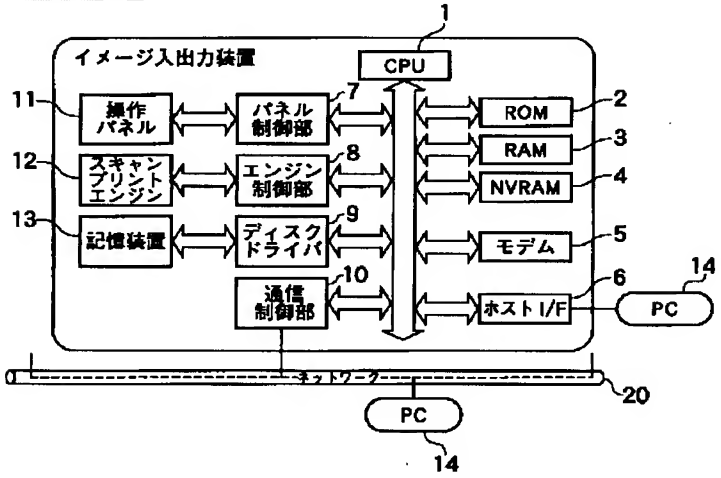
[Brief Description of the Drawings]
[Drawing 1]It is an image input/output device with which the user interface of this invention is applied.
[Drawing 2]It is a figure explaining the correlation of the software built into the inside of an image input/output device, and hardware.
[Drawing 3]It is a figure for explaining a device manager's software configuration.
[Drawing 4]It is a figure for explaining the software configuration of a scanner control part.
[Drawing 5]It is a figure explaining the situation of the message communication of each software part at the time of book reading.
[Drawing 6]It is a figure explaining the situation of the message communication of each software part at the time of the homing operation of a carriage.
[Drawing 7]They are other figures for explaining the software configuration of a scanner control part.
[Drawing 8]It is a figure showing the relation of the time-speed of the stepping motor at the time of Book reading.
[Drawing 9]It is a figure showing the message communication between each part articles at the time of Book reading.
[Drawing 10]It is a figure showing the internal configuration of a scan part article.
[Drawing 11]It is a figure showing the internal configuration of stepping motor parts.
[Description of Notations]
1 [-- A modem, 6 / -- Host I/F,] -- CPU, 2 -- ROM, 3 -- RAM, 5 7 -- A panel control part, 8 -- An Engine control section and 9 -- Disk driver, 10 [-- Memory storage, 14 / -- PC, 100 / -- Application, 110 / -- A kernel and 120 / -- A driver, 130 / -- Hardware.] -- A communication control part and 11 -- A navigational panel, 12 -- Scanning print engine and 13

* NOTICES *

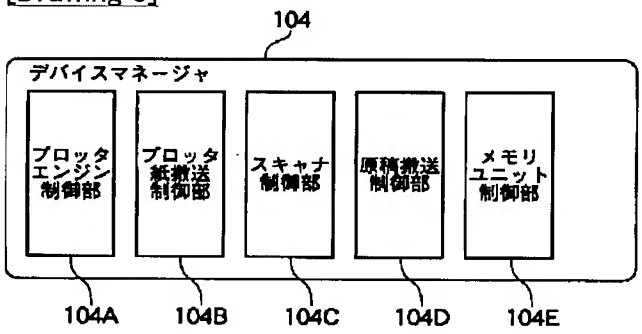
1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

DRAWINGS

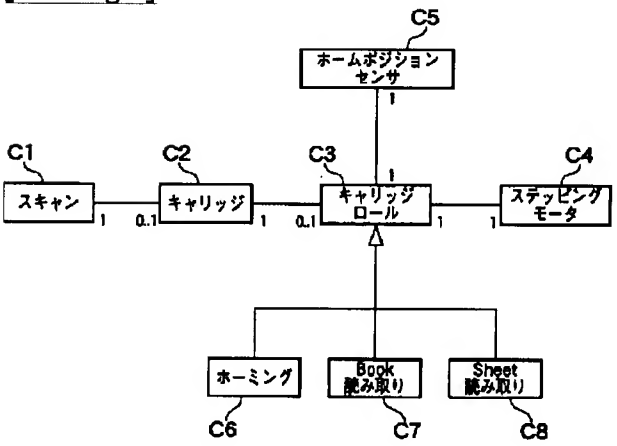
[Drawing 1]



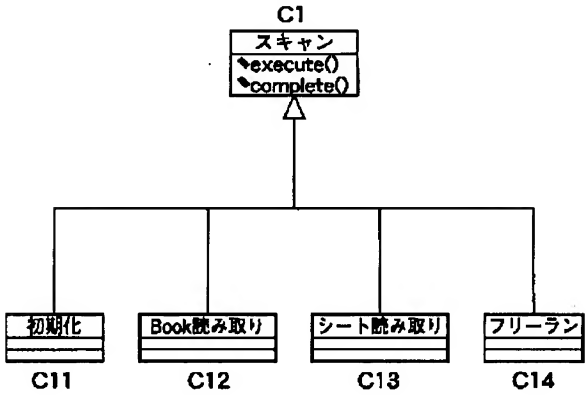
[Drawing 3]



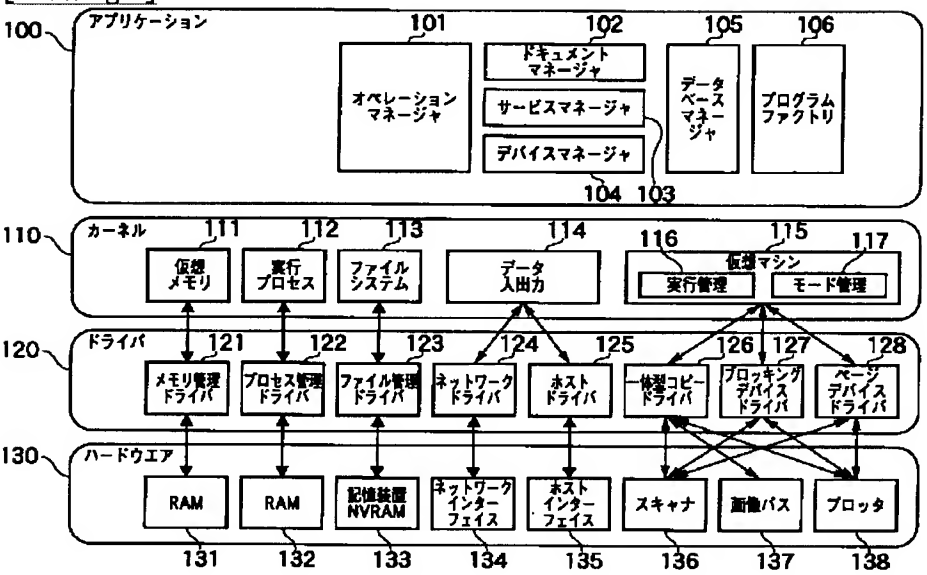
[Drawing 4]



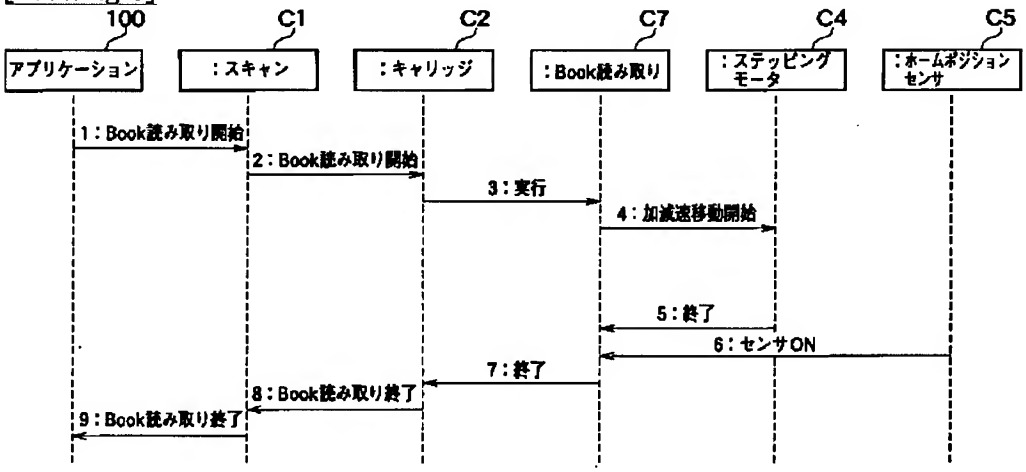
[Drawing 10]



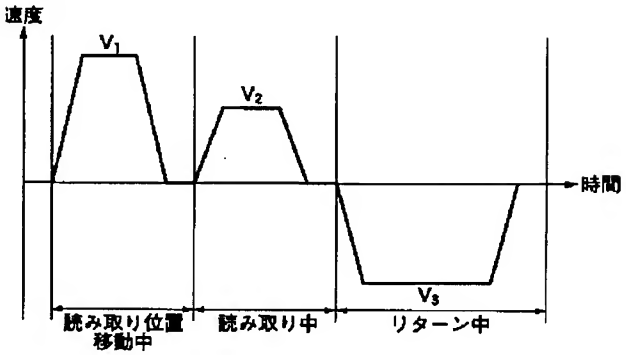
[Drawing 2]



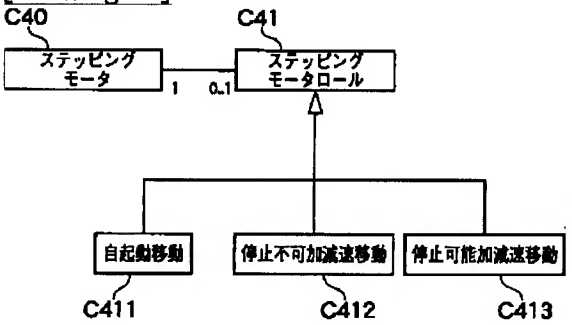
[Drawing 5]



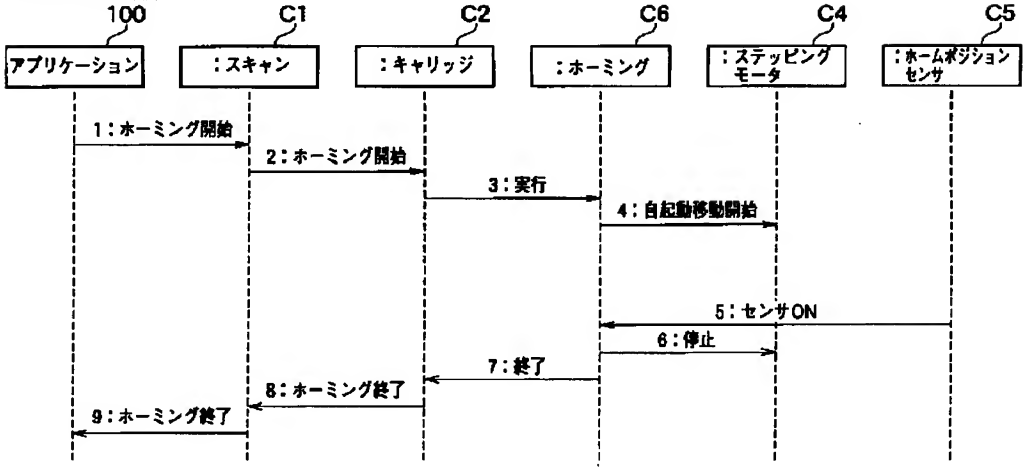
[Drawing 8]



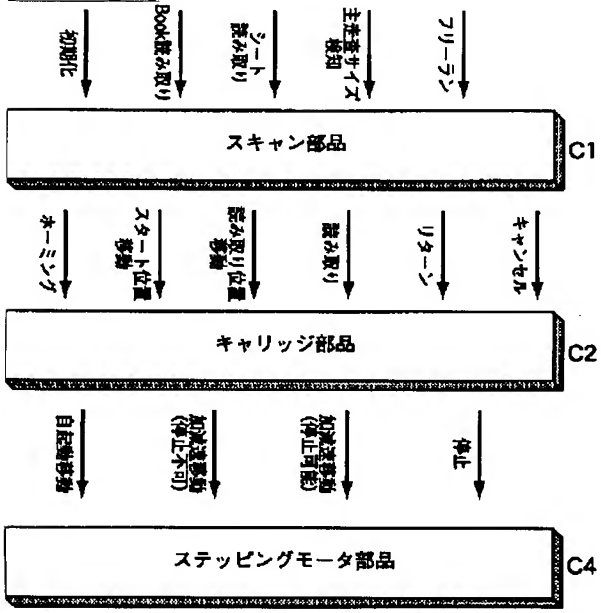
[Drawing 11]



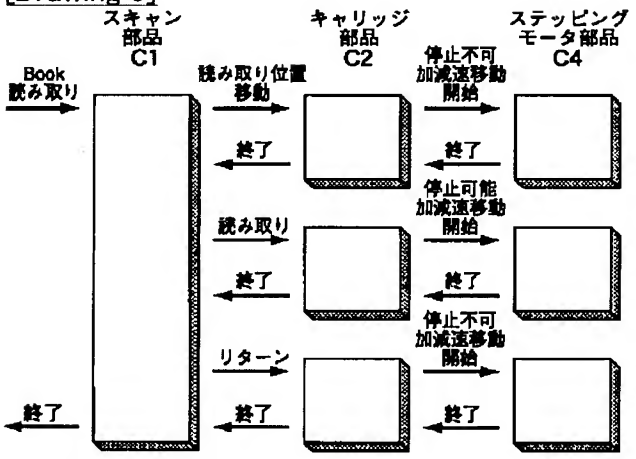
[Drawing 6]



[Drawing 7]



[Drawing 9]



[Translation done.]

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Ｈ０４Ｎ	1/04		Ｈ０４Ｎ	1/04	Ｚ　５Ｃ０７２

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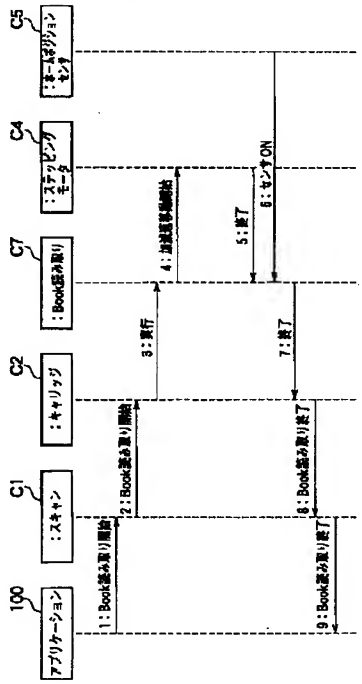
5B076 AB01 DD05
5C072 AA01 BA05 MB01

(54)【発明の名称】　スキャナ制御システム及び該スキャナ制御システムを備えた画像形成装置

(57)【要約】
【課題】　スキャナ制御を行うソフトウェアを独立した複数のソフトウェア部品で構成し、各部品を協調動作させてスキャナ制御を行う。
【解決手段】　画像形成装置のスキャナ制御システムにおいて、スキャナ制御を行うソフトウェアを、各々独立した部品として構成されたスキャン部品Ｃ１と、キャリッジ部品Ｃ２と、キャリッジロール部品Ｃ３と、読み取り制御に必要なセンサ、ステッピングモータ等の各デバイスを直接制御するソフトウェア部品Ｃ４，Ｃ５で構成する。各ソフトウェア部品を互いに協調動作することによってスキャナを制御し、原稿の読み取りを行う。



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【特許請求の範囲】

【請求項１】　原稿の読み取りを行うスキャナの制御を行うソフトウェアの構成を、各々独立した部品として構成された読み取り要求を受け付けるソフトウェア部品と、読み取りを行う走行体を管理するソフトウェア部品と、様々な読み取り要求に応じた走行体の制御を行うソフトウェア部品と、読み取り制御に必要なセンサ、ステッピングモータ等の各デバイスを直接制御するソフトウェア部品で構成し、各ソフトウェア部品が互いに協調動作しながら原稿の読み取り制御を行うことを特徴とするスキャナ制御システム。

【請求項２】　請求項１に記載されたスキャナ制御システムにおいて、上記様々な読み取り要求に応じた走行体の制御を行うソフトウェア部品を抽象的なクラスとし、該ソフトウェア部品のサブクラスを、キャリッジの動作を行うソフトウェア部品で構成したことを特徴とするスキャナ制御システム。

【請求項３】　請求項２に記載されたスキャナ制御システムにおいて、上記様々な読み取り要求に応じた走行体の制御を行うソフトウェア部品と、該ソフトウェア部品のサブクラスのソフトウェア部品を、同一の操作インターフェイスとすることを特徴とするスキャナ制御システム。

【請求項４】　原稿の読み取りを行うスキャナの制御を行うソフトウェアの構成を、スキャン部品と、キャリッジ部品と、ステッピングモータ部品とで構成し、各ソフトウェア部品を、互いに協調動作する独立した部品として構成し、各々が協調動作しながら原稿の読み取り制御を行うことを特徴とするスキャナ制御システム。

【請求項５】　請求項４に記載されたスキャナ制御システムにおいて、上記スキャン部品の内部構成が、他の部品からの操作インターフェイスを持った抽象的なクラスであるスキャンクラスと、共通の操作インターフェイスを持つサブクラスからなることを特徴とするスキャナ制御システム。

【請求項６】　請求項５に記載されたスキャナ制御システムにおいて、上記スキャンクラスのサブクラスが、原稿読み取りを行うソフトウェアの各サービスに対応して存在し、各サブクラスがサービスの内容に応じて、キャリッジ部品への必要なメッセージを送ることで原稿の読み取り制御を実施することを特徴とするスキャナ制御システム。

【請求項７】　請求項５，６のいずれかに記載されたスキャナ制御システムにおいて、キャリッジ部品からスキャンクラスのサブクラスへの操作インターフェイスを統一したことを特徴とするスキャナ制御システム。

【請求項８】　請求項４に記載されたスキャナ制御システムにおいて、上記ステッピングモータ部品の内部構成が、ステッピングモータの状態管理を行うステッピングモータクラスと、ステッピングモータの駆動方式を抽象

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化して持ったステッピングモータロールクラスと、上記ステッピングモータロールクラスのサブクラスで、ステッピングモータの駆動方式に応じてデバイスを制御するクラスからなることを特徴とするスキャナ制御システム。

【請求項９】　請求項８に記載されたスキャナ制御システムにおいて、上記ステッピングモータロールクラスのサブクラスへの操作インターフェイスを統一したことを特徴とするスキャナ制御システム。

【請求項１０】　請求項１乃至９のいずれかに記載されたスキャナ制御システムを備えた画像形成装置。

【発明の詳細な説明】

【０００１】

【発明の属する技術分野】本発明は部品化したソフトウェアを使用することにより、機能拡張を容易にするとともに、ソフトウェアの開発効率を高めたスキャナ制御システム及び該スキャナ制御システムを備えた画像形成装置に関するものである。

【０００２】

【従来の技術】近年、コンピュータハードウェアのパフォーマンスアップと低コスト化を受けて、ソフトウェアの規模の増大と、その対象となる問題の複雑化は年々増している。一方、それらソフトウェア商品、もしくはソフトウェアを組み込んだ機器の商品の開発サイクルは、年々短縮される傾向にある。そのような環境の中、ソフトウェア業界においてはその開発効率の改善が必然的な要求となっている。その一つの解決法として、ソフトウェアの部品化が考えられる。これは、ソフトウェアシステムを複数の独立したコンポーネント（ソフトウェア部品）によって構成し、そのコンポーネント単位で他のシステムで再利用しようとする考えである。それにより、中、長期的なソフトウェア開発効率を改善することができる。ソフトウェア部品の自動生成方法については、例えば、「データ中心型ソフトウェア部品によるプログラム自動生成」（特開平５－１０８３１９号公報）、「プログラム生成システム」（特開平９－２０４３０１号公報）、「ソフトウエア自動生成装置」（特開平１０－２４０５１４号公報）、「制御装置のオブジェクト指向開発方法」（特開平８－１８５４２４号）等の提案が、また、ソフトウェア部品に関するものは例えば、「ソフトウェア部品再利用方式」（特開平６－２５０号公報）、「ソフトウェア部品装置」（特開平７－１４１号公報）等が公開されているが、スキャナの制御に対する部品化方法についてはまだ提案されていない。

【０００３】

【発明が解決しようとする課題】本発明の課題は、原稿の読み取りを行うスキャナの制御を行うソフトウェアシステムにおいて、その領域（ここではスキャナ）特有の部品化を行うことによりソフトウェアの再利用性を向上させることにある。具体的には、請求項１の発明の目的

は、原稿の読み取りを行うスキャナの制御を行うソフトウェアの構成を、読み取り要求を受付るソフトウェア部品と、読み取りを行う走行体を管理するソフトウェア部品と、様々な読み取り要求に応じた走行体の制御を行うソフトウェア部品と、読み取り制御に必要なセンサ、ステッピングモータ等の各デバイスを直接制御するソフトウェア部品で構成し、各ソフトウェア部品を、互いに協調動作する独立した部品として構成し、各々が協調動作しながらスキャナの読み取り制御を行うことで、多機種に対して本ソフトウェア部品を適用し、かつ、スキャナ制御機能の拡張を容易にし、ソフトウェア開発効率を向上させることである。

【０００４】請求項２の発明の目的は、キャリッジロール部品を抽象クラスとし、キャリッジロール部品のサブクラスをスキャン要求に応じたキャリッジの制御を行うソフトウェア部品で構成する、つまり階層構造にすることによって、スキャナの機能の拡張を容易にすることである。

【０００５】請求項３の発明の目的は、キャリッジロール部品とそのサブクラスのソフトウェア部品の操作インターフェイスを同一にすることで、スキャナの機能拡張を容易にし、かつソフトウェアの信頼性を向上させることである。

【０００６】請求項４の発明の目的は、スキャナ制御を行うソフトウェアの構成を、読み取りの要求を受け付け、要求に応じて走行体へ動作指示を行うソフトウェア部品（スキャン部品という。）と、読み取り時の各状態に応じて、走行体を制御するソフトウェア部品（キャリッジ部品という。）と、走行体を移動するために必要なステッピングモータの駆動を行うソフトウェア部品（ステッピングモータ部品という。）で構成し、各ソフトウェア部品を、互いに協調動作する独立した部品として構成し、各々が協調動作しながらスキャナの読み取り制御を行うことで、多機種に対して本ソフトウェア部品を適用し、かつ、スキャナ制御機能の拡張を容易にし、ソフトウェア開発効率を向上させることである。

【０００７】請求項５の発明の目的は、スキャナ制御を行うソフトウェアの構成を、スキャン部品と、キャリッジ部品と、ステッピングモータ部品とで構成し、スキャン部品の内部構成を、他の部品からの操作インターフェイスを持った抽象的なクラス（スキャンクラスという。）と、共通の操作インターフェイスを持つサブクラスで構成し、各ソフトウェア部品を、互いに協調動作する独立した部品として構成し、各々が協調動作しながらスキャナの読み取り制御を行うことで、スキャナの制御方式の追加、変更を容易にし、ソフトウェア開発効率を向上させることである。

【０００８】請求項６の発明の目的は、読み取りの要求を受け付け、要求に応じて順次走行体へ動作指示を行うスキャン部品の構成を、他の部品からの操作インターフェイスを持った抽象的なクラス即ちスキャンクラスと、共通の操作インターフェイスを持つサブクラスで構成し、上記スキャンクラスのサブクラスが、原稿読み取りを行うソフトウェアの各サービスに対応して存在し、各サブクラスがサービスの内容に応じた、キャリッジ部品の使い方をの情報を保持しており、つまり知っており、キャリッジ部品への必要なメッセージを送ることで原稿の読み取り制御を実施し、スキャナ制御ソフトウェアの機能（サービス）の追加、変更を容易にし、ソフトウェア開発効率を向上させることである。

【０００９】請求項７の発明の目的は、上記キャリッジ部品からスキャンクラスのサブクラスへの操作インターフェイスを統一することとすることで、スキャナ制御ソフトウェアの機能（サービス）の追加・変更時に他のソフトウェア部品の変更量を少なくし、ソフトウェア部品の信頼性を向上させることである。

【００１０】請求項８の発明の目的は、ステッピングモータの駆動を行うソフトウェア部品の構成を、ステッピングモータの状態管理を行うクラスと、ステッピングモータを駆動する役割を持った抽象的なクラスと、上記ステッピングモータロールクラスのサブクラスで、ステッピングモータの駆動方式に応じてデバイスを制御するクラスで構成することで、ステッピングモータの駆動方式の追加、変更を容易にし、ソフトウェア開発効率を向上させることを目的とする。

【００１１】請求項９の発明の目的は、上記ステッピングモータロールクラスのサブクラスへの操作インターフェイスを統一することで、モータ駆動方式の追加・変更を容易にし、かつソフトウェア部品の信頼性を向上させることである。

【００１２】請求項１０の発明の目的は、請求項１乃至９のいずれかに記載されたスキャナシステムを備えた画像形成装置を提供することである。

【００１３】

【課題を解決するための手段】本発明は、例えば外部システムから画像データを受け取る外部インターフェイス部、画像を保存しておく記録装置、画像を用紙に印刷するプロッタ部、画像を読み取るスキャナ部、印刷された用紙を分配して置くための排紙ビン部などを有する画像形成装置において、原稿の読み取りを行うスキャナの制御を行うソフトウェアが複数の独立した部品によって構成され、スキャナ制御システムがそれら部品の協調動作により動作する機構を持つようにしたものであって、請求項１の発明は、原稿の読み取りを行うスキャナの制御を行うソフトウェアの構成を、各々独立した部品として構成された読み取り要求を受け付けるソフトウェア部品と、読み取りを行う走行体を管理するソフトウェア部品と、様々な読み取り要求に応じた走行体の制御を行うソフトウェア部品と、読み取り制御に必要なセンサ、ステッピングモータ等の各デバイスを直接制御するソフトウ

ェア部品で構成し、各ソフトウェア部品が互いに協調動作しながら原稿の読み取り制御を行うことを特徴とするスキャナ制御システムである。

【００１４】請求項２の発明は、請求項１に記載されたスキャナ制御システムにおいて、上記様々な読み取り要求に応じた走行体の制御を行うソフトウェア部品を抽象的なクラスとし、該ソフトウェア部品のサブクラスを、キャリッジの動作を行うソフトウェア部品で構成したことを特徴とするスキャナ制御システムである。

【００１５】請求項３の発明は、請求項２に記載されたスキャナ制御システムにおいて、上記様々な読み取り要求に応じた走行体の制御を行うソフトウェア部品と、該ソフトウェア部品のサブクラスのソフトウェア部品を、同一の操作インターフェイスとすることを特徴とするスキャナ制御システムである。

【００１６】請求項４の発明は、原稿の読み取りを行うスキャナの制御を行うソフトウェアの構成を、スキャン部品と、キャリッジ部品と、ステッピングモータ部品とで構成し、各ソフトウェア部品を、互いに協調動作する独立した部品として構成し、各々が協調動作しながら原稿の読み取り制御を行うことを特徴とするスキャナ制御システムである。

【００１７】請求項５の発明は、請求項４に記載されたスキャナ制御システムにおいて、上記スキャン部品の内部構成が、他の部品からの操作インターフェイスを持った抽象的なクラスであるスキャンクラスと、共通の操作インターフェイスを持つサブクラスからなることを特徴とするスキャナ制御システムである。

【００１８】請求項６の発明は、請求項５に記載されたスキャナ制御システムにおいて、上記スキャンクラスのサブクラスが、原稿読み取りを行うソフトウェアの各サービスに対応して存在し、各サブクラスがサービスの内容に応じて、キャリッジ部品への必要なメッセージを送ることで原稿の読み取り制御を実施することを特徴とするスキャナ制御システムである。

【００１９】請求項７の発明は、請求項５，６のいずれかに記載されたスキャナ制御システムにおいて、キャリッジ部品からスキャンクラスのサブクラスへの操作インターフェイスを統一したことを特徴とするスキャナ制御システムである

【００２０】請求項８の発明は、請求項４に記載されたスキャナ制御システムにおいて、上記ステッピングモータ部品の内部構成が、ステッピングモータの状態管理を行うステッピングモータクラスと、ステッピングモータの駆動方式を抽象化して持ったステッピングモータロールクラスと、上記ステッピングモータロールクラスのサブクラスで、ステッピングモータの駆動方式に応じてデバイスを制御するクラスからなることを特徴とするスキャナ制御システムである。

【００２１】請求項９の発明は、請求項８に記載されたスキャナ制御システムにおいて、上記ステッピングモータロールクラスのサブクラスへの操作インターフェイスを統一したことを特徴とするスキャナ制御システムである。

【００２２】請求項１０の発明は、請求項１乃至９のいずれかに記載されたスキャナ制御システムを備えた画像形成装置である。

【００２３】

【発明の実施の形態】図１は、本発明のユーザインターフェースシステムが適用されるハードウエア構成であるイメージ入出力装置を示している。図中、１はプロセッサ（ＣＰＵ）であって、装置全体の制御を司るものであり、その制御下にＲＯＭ２、ＲＡＭ３、ＮＶＲＡＭ４、操作パネル１１とパネル制御部７、スキャン/プリントエンジン１２とエンジン制御部８、記憶装置１３とディスクドライバ９、通信制御部１０、モデム５、外部Ｉ／Ｆ６が接続されている。ここで、ＲＯＭ２には、プログラムコード、フォント、及びその他の静的なデータが格納されており、ＲＡＭ３は一時的な記憶場所として利用される。NVRAM４は、不揮発性のデータを格納し、操作パネル１１とパネル制御部７は、ユーザとのインターフェイスを司る。スキャン/プリントエンジン１２とエンジン制御部８は、イメージデータの入出力ユニットとして、紙原稿の読み取りと転写紙への印刷を実行する部分である。記憶装置１３とディスクドライバ９は、大量のイメージデータなどを蓄積したり、データベースの記憶場所として利用され、通信制御部１０は、イーサネット等のネットワーク２０に接続され、外部の機器との通信を可能にしている。更に、モデム５は、公衆回線と接続され、外部の機器との通信を可能にし、ホストＩ／Ｆ６は、セントロニクスやRS-232C等のインターフェイスを用いて例えばＰＣなどのホスト外部の機器との通信を可能にしている。

【００２４】図２はユーザーインターフェース制御装置の内部に組み込まれたソフトウェアとハードウェアの相互関係の構造を示している。図示のように、ユーザーインターフェース制御装置の内部は、大きく分けるとアプリケーション層、その下層のカーネル層及び、その下層のドライバ層、ドライバ層の下層のハードウェア層の４層からなっている。

【００２５】（アプリケーション層１００）アプリケーション層１００は、コピー・ファクス・プリンタなどのアプリケーションを形成するレイヤーである。アプリケーション層１００は、オペレーションマネージャ１０１と、ドキュメントマネージャ１０２と、サービスマネージャ１０３と、デバイスマネージャ１０４と、データベースマネージャ１０５とを有する。

【００２６】オペレーションマネージャ１０１は、装置に付属している操作パネルを制御するものであり、ボタンの表示、ボタンオペレーションのノーティファイ・ア

ラートの通知などを行う。ドキュメントマネージャ１０２は、コピー・ファクス・プリンタなどのシナリオに沿ってドキュメントをハンドリングするアプリケーションとしては中心となる機能ブロックである。サービスマネージャ１０３は、ドキュメントハンドリングの際に共通に必要となる機能ブロックであり、各種サービスの管理・実行を行う。デバイスマネージャ１０４は、スキャナ・プロッタ・画像バスといった物理デバイスの動作を決定する機能ブロックであり、各種デバイスの管理･実行を行う。　データベースマネージャ１０５は、フォント・定形フォーム・ファクス受信履歴・装置の利用履歴・課金データなどの永続データの維持管理を行う。

【００２７】カーネル層１１０は、仮想メモリ１１１と、実行プロセス１１２と、ファイルシステム１１３と、データ入出力１１４と、仮想マシン１１５とを有し、さらに仮想マシン１１５は、実行管理１１６と、モード管理１１７を有し、通常ＯＳのカーネルとして組み込まれ、各種デバイスを抽象化してアプリケーションに対しサービスを提供するものである。アプリケーション層１００はカーネル層１１０に対しシステムコールすることにより動作する。

【００２８】ドライバ層１２０は、各種ハードウエアを駆動するための制御を実行する機能ブロックの集まりである。ドライバ層１２０には、メモリ管理ドライバ１２１、プロセス管理ドライバ１２２、ファイル管理ドライバ１２３、ネットワークドライバ１２４、ホストドライバ１２５、一体型コピードライバ１２６、ブロッキングデバイスドライバ１２７、ページデバイスドライバ１２８を有する。

【００２９】ハードウェア層１３０は、各種ハードウェアを駆動するための制御を実行する機能ブロックの集合であり、装置内に存在する制御可能なリソースの集合である。ハードウェア層１３０には、例えば、メモリ管理ドライバ１２１により制御されるＲＡＭ１３１、プロセス管理ドライバ１２２により制御されるＲＡＭ１３２、ファイル管理ドライバ１２３により制御される記憶装置（ＮＶＲＡＭ）１３３、ネットワークドライバ１２４により制御されるネットワークインターフェース１３４、ホストドライバ１２５によって制御されるホストインターフェース１３５等から構成されている。また、一体型コピードライバ１２６、ブロッキングデバイスドライバ１２７、ページデバイスドライバ１２８により制御されるスキャナ１３６、画像バス１３７、プロッタ１３８等も含んでいる。

【００３０】ここで、デバイスマネージャ１０４のソフトウェア構成について説明する。デバイスマネージャ１０４は図３に示すように、プロッタエンジン制御部１０４Ａ、プロッタ紙搬送制御部１０４Ｂ、スキャナ制御部１０４Ｃ、原稿搬送制御部１０４Ｄ、メモリユニット制御部１０４Ｅからなっている。ここで、

（１）プロッタエンジン制御部１０４Ａでは、プロッタの作像、定着部のデバイスの制御を行う。

（２）プロッタ紙搬送制御部１０４Ｂでは、プロッタの紙搬送に関するデバイスの制御を行う。

（３）スキャナ制御部１０４Ｃでは、スキャナの読み取り制御に関わるデバイスの制御を行う。

（４）原稿搬送制御部１０４Ｄでは、原稿の搬送制御に関わるデバイスの制御を行う。

（５）メモリユニット制御部１０４Ｅでは、ハードディスク等のメモリユニットの制御を行う。

【００３１】（請求項１乃至３の発明）次に、請求項１乃至３の発明について、スキャナ制御部のソフトウェア構成を説明する。これらの発明は、アプリケーション層１００のデバイスマネージャ１０４内にあるスキャナ制御部１０４Ｃのソフトウェア構成に関するものである。図４はその構成を示す図である。長方形はデータと操作を持つ独立したソフトウェアコンポーネント(オブジェクト指向のオブジェクト、ソフトウェア部品。)を表わしており、長方形間を結ぶ線はこれらのオブジェクト間の関係を表わしている。図４は、オブジェクト指向分析手法の１つである統一モデリング言語（ＵＭＬ（Unified Modeling Language））を用いた表記法である.これらの部品群の協調動作によって、スキャナの制御が実現される。

【００３２】（動作）本システムは、必要な時に部品に対する実体(オブェクト指向でいうインスタンス、以後インスタンスと呼ぶ)を生成(メモリー上にアロケート)し、それらインスタンスが通信し合うことにより動作する。その通信と動作の方法は実装依存となるが、簡単な方法としては、リアルタイムＯＳを使用し、生成された各インスタンスに対して一つのタスクを割当て、リアルタイムＯＳによって提供されるタスク間通信によってインスタンス間の通信を行う方法が考えられる。ここでは動作の例として、スキャナのブック（Ｂｏｏｋ）読み取りモードの制御方法について説明する。また、スキャナの初期動作として、キャリッジを所定の位置に移動させる処理が必要である。この動作をホーミングと呼ぶ。ホーミング動作の制御方法についても説明する。

【００３３】図５は、ブック読み取り時における各ソフトウェア部品のメッセージ通信の様子を表している。各ソフトウェア部品は、内部に状態を持っており、他のソフトウェア部品からのメッセージを受信すると内部の状態により、所定の動作を行う。各ソフトウェア部品がメッセージを通信しながら協調動作することでスキャナの制御を行う。上位のアプリケーション層１００から、スキャン部品Ｃ１に対して、ブック読み取り開始のメッセージを送信すると、スキャン部品Ｃ１は、キャリッジ部品Ｃ２、ブック読み取り部品Ｃ７、ステツピングモータ部品Ｃ４、ホームポジションセンサ部品Ｃ５を生成し、キャリッジ部品Ｃ２に対して、ブック読み取り開始のメ

ッセージを送信する。キャリッジ部品Ｃ２は、ブック読み取り開始メッセージを受信すると、自身の状態を見て、ブック読み取りが可能な状態であれば、ブック読み取り部品Ｃ７に実行のメッセージを送信する。

【００３４】ブック読み取り部品Ｃ７は、ブック読み取り特有の制御アルゴリズムを有しており、ブック読み取りに必要なステツピングモータの動作スペックを作成し、ステツピングモータ部品Ｃ４に移動開始のメッセージを送る。ステッピングモータ部品Ｃ４は、ブック読み取り部品Ｃ７が作成した動作スペックに従い、実際のステッピングモータの駆動制御を行う。所定の動作スペックにしたがって原稿の読み取りが終了すると、ステッピングモータ部品Ｃ４は、ブック読み取り部品Ｃ７に終了のメッセージを送信する。ブック読み取り部品Ｃ７は、終了メッセージを受信した後、ホームポジションセンサ部品Ｃ５に状態を問い、センサがONしていれば、読み取り正常終了と判断し、キャリッジ部品Ｃ２に終了のメッセージを送る。キャリッジ部品Ｃ２は、ブック読み取り終了のメッセージをスキャン部品Ｃ１に送信し、スキャン部品Ｃ１がブック読み取り終了をアプリケーション層１００に通知することで、アプリケーションはブック読み取りが正常に終了したことを知ることができる。

【００３５】次に、キャリッジのホーミング動作制御について図６を参照して説明する。上位のアプリケーション層１００から、スキャン部品Ｃ１に対して、ホーミング開始のメッセージを送信すると、スキャン部品Ｃ１は、キャリッジ部品Ｃ２、ホーミング部品Ｃ６、ステッピングモータ部品Ｃ４、ホームポジションセンサ部品Ｃ５を生成し、キャリッジ部品Ｃ２に対して、ホーミング開始のメッセージを送信する。キャリッジ部品Ｃ２は、ホーミング開始メッセージを受信すると、自身の状態を見て、ホーミングが可能な状態であれば、ホーミング部品Ｃ６に実行のメッセージを送信する。ホーミング部品Ｃ６は、ホーミング動作特有の制御アルゴリズムを有しており、ステツピングモータ部品Ｃ４に自起動領域での移動開始のメッセージを送る。ステッピングモータ部品Ｃ４は、ホーミング部品Ｃ６のメッセージに従い、実際のステッピングモータを自起動領域で駆動させる。ステンピングモークの駆動によりキャリッジがホームポジションまで移動すると、ホームポジションセンサがONする。

【００３６】ホームポジションセンサ部品Ｃ５はホームポジションセンサのの検出すると、ホーミング部品Ｃ６にセンサのメッセージを送信する。ホーミング部品Ｃ６は、センサONを受信すると、ホーミング正常終了と判断し、ステッピングモータ部品Ｃ４に停止のメッセージとキャリッジ部品Ｃ２に終了のメッセージを送る。キャリッジ部品Ｃ２は、ホーミング終了のメッセージをスキャン部品Ｃ１に送信し、スキャン部品Ｃ１がアプリケーション層１００にホーミング終了を通知することで、アプリケーションはホーミング動作が正常に終了したことを知ることができる。

【００３７】以上述べたように、各ソフトウェア部品がメッセージ通信をやり取りすることで、スキャナのブック読み取り制御、ホーミング制御を実施することができる。また本実施例では説明していないが、シートスルードキュメントフィーダを有するスキャナの場合、シートスルー読み取りに必要な制御は、シート（Sheet）読み取り部品Ｃ８がシートスルー読み取りに必要なアルゴリズムを有しており、ステッピングモータ部品Ｃ４、ホームポジションセンサ部品Ｃ５にメッセージを送ることで実施する。今後新たな読み取りシステムを追加する場合は、キャリッジロール部品Ｃ３のサブクラスのソフトウェア部品として追加し、操作インターフェイスを統一することで、他のソフトウェア部品への影響を少なくでき、かつ機能の拡張を容易に行うことができる。機種によるステッピングモータなどのデバイスの違いは、ステッピングモータ部品の変更で吸収することができる。このように、本ソフトウェア部品を多機種に対して適用でき、ソフトウェアの再利用性、開発効率を向上させることができる。

【００３８】（請求項４乃至７の発明）次に、請求項４乃至７の発明について、スキャナ制御部のソフトウェア構成を説明する。これらの発明も、請求項１乃至３の発明と同様にアプリケーション層１００のデバイスマネージャ１０４内にあるスキャナ制御部のソフトウェア構成に関するものであって、図７はその構成を示す図である。図中、図４について示したのと同様に、長方形はデータと操作を持つ独立したソフトウェアコンポーネントで、スキャン部品Ｃ１（読み取りの要求を受け付け、要求に応じて順次走行体へ動作指示を行うソフトウェア部品）と、キャリッジ部品Ｃ２（読み取り時の各状態に応じて、走行体を制御するソフトウェア部品）と、ステッピングモータ部品Ｃ４（走行体を移動するために必要なステッピングモータの駆動を行うソフトウェア部品）で構成されている。これら部品群の協調動作によって、スキャナの制御が実現される。

【００３９】次に、その動作について説明する。図８は、Book読み取りを行う際のステッピングモータの時間ー速度を示している。即ち、上位アプリケーションから、Book読み取りの指示があると、走行体を通常の読み取り速度Ｖ２より高速Ｖ１で駆動し、読み取り開始位置の手前まで移動させ、一旦停止させる。その後、再度モータを駆動し読み取りを開始する。読み取り範囲を通過すると、モータを逆回転させ、走行体を速度Ｖ３で待機位置まで戻す。

【００４０】図９は、上記Book読み取り時の各部品間のメッセージ通信を示している。上位アプリケーションから、スキャン部品Ｃ１がBook読み取り開始の指示を受信すると、キャリッジ部品Ｃ２に対して読み取り位置移動

の指示を送る。キャリッジ部品Ｃ２は、ステッピングモータ部品Ｃ４に停止不可加減速移動開始の指示を送り、走行体を通常の読み取り速度Ｖ２より高速Ｖ１で駆動し、読み取り開始位置の手前まで移動させ、一旦停止させて移動が終了する。移動が終了すると、ステッピングモータ部品Ｃ４はキャリッジ部品Ｃ２に終了のメッセージを送る。キャリッジ部品Ｃ２は、終了のメッセージを受信するとスキャン部品Ｃ１に終了のメッセージを送る。スキャン部品Ｃ１は、読み取り位置移動終了のメッセージを受信すると、次にキャリッジ部品Ｃ２に読み取り指示を送る。キャリッジ部品Ｃ２は、ステッピングモータ部品Ｃ４に停止可能加減速移動開始の指示を送り、走行体を通常の読み取り速度Ｖ２で移動させ読み取りを行った後停止する。移動が終了すると、ステッピングモータ部品Ｃ４は、キャリッジ部品Ｃ２に終了のメッセージを送り、キャリッジ部品Ｃ２はスキャン部品Ｃ１に終了のメッセージを送る。スキャン部品Ｃ１は、読み取り終了のメッセージを受けると、キャリッジ部品Ｃ２にリターンの指示を送る。キャリッジ部品Ｃ２は、ステッピングモータ部品Ｃ４に停止不可加減速移動開始の指示を送り、モータを逆回転させ、走行体を速度Ｖ３で待機位置まで戻して停止する。移動が終了すると、ステッピングモータ部品Ｃ４は、キャリッジ部品Ｃ２に終了のメッセージを送り、キャリッジ部品Ｃ２は、スキャン部品Ｃ１に終了のメッセージを送る。

【００４１】次に、スキャン部品Ｃ１の内部構成について記述する。図１０は、オブジェクト指向分析手法の１つである、統一モデリング言語（ＵＭＬ：Unified Modeling Language）を用いた表記法によりその構造を示した図である。図中、長方形はオブジェクト指向ソフトウェアにおけるクラスを表し、長方形間の線は、クラス間の関係を表している。ここでは、スキャンクラスのサブクラスとして、初期化Ｃ１１，Book読み取りＣ１２、シート読み取りＣ１３、フリーランＣ１４の各サブクラスが存在している。

【００４２】更に、スキャナ制御ソフトウェアが提供する機能（サービス）について説明する。スキャンクラスのサブクラスはスキャナ制御ソフトウェアの各サービスに対応して存在する。つまり、上記サブクラスは原稿読み取りを行うソフトウェアの各サービスに対応して存在し、各サブクラスにはサービスの内容に応じたキャリッジ部品Ｃ１の使い方について予め定義してあるため、つまり、各サブクラスはそれぞれのサービスで実施する情報を保持しており、それに従ってキャリッジ部品に必要なメッセージを送ることで、原稿の読み取り制御を実施するようになっている。スキャナ制御ソフトウェアが提供する機能（サービス）は具体的には、例えば、初期化、Book読み取り、シート読み取り、フリーランがあり、この内、初期化機能は、電源投入後、予熱モード解除時に使用し、キャリッジを待機位置に移動したり、画像処理設定を初期化するなどの内容である。Book読み取り機能は、Book読み取り時に使用し、キャリッジを移動させて原稿を読み取ることを内容としている。シート読み取り機能は、シートスルーＤＦ（原稿送り装置）を使用する読み取り時に使用し、原稿を移動させて読み取ることを内容としている。フリーラン機能は、サービスマン等による動作確認時に使用し、低速移動中にキャンセル要求、間欠停止要求により減速して停止することをその内容としている。

【００４３】ここで、Book読み取り時のスキャン部品の制御動作を説明する。アプリケーションソフトウェアがスキャン制御ソフトウェアを使用してBook読み取りを開始する場合、まず、スキャンクラスＣ１のサブクラスであるBook読み取りクラスＣ１２のインスタンスを生成し、このインスタンスに対して、executeのメッセージを送る。Book読み取りクラスＣ１２のインスタンスは、キャリッジ部品Ｃ２に対して、読み取り位置移動のメッセージを送る。キャリッジ部品はステッピングモータ部品を使用して実際に読み取り位置までキャリッジが移動すると、スキャン部品内のBook読み取りクラスのインスタンスにcompleteのメッセージを送る。Book読み取りクラスＣ１２のインスタンスは、読み取り位置移動が終了すると、次に実施する動作についての情報を保持しており、つまり知っていて、それに従ってキャリッジ部品Ｃ２に対して、読み取りのメッセージを送る。キャリッジ部品Ｃ２は読み取りを終了するとcompleteのメッセージをBook読み取りクラスＣ１２のインスタンスに送信する。Book読み取りクラスのインスタンスはキャリッジ部品Ｃ２にリターンの指示を送り、終了するとcompleteのメッセージを受け取る。

【００４４】（請求項４，８及び９の発明）次に、請求項４，８及び９の発明について、スキャナ制御部のソフトウェア構成を説明する。この実施例も、上記請求項１乃至７の発明と同様にアプリケーション層１００のデバイスマネージャ１０４内にあるスキャナ制御部１０４Ｃのソフトウェア構成であるが、スキャナ制御部の全体が例示される図７の構成において示されるステッピングモータ部品Ｃ４に関するものである。以下に、この実施例のステッピングモータ部品について記述する。図１１はステッピングモータ部品Ｃ４の内部構成を示す図である。図１１は、オブジェクト指向分析手法の１つである、統一モデリング言語（ＵＭＬ：Unified Modeling Language）を用いた表記法によりその構造を示した図である。図中、長方形はオブジェクト指向ソフトウェアにおけるクラスを表し、長方形間を結ぶ線はこれらのオブジェクト間の関係を表わしている。ここでは、ステッピングモータクラスＣ４０に結ばれたステッピングモータロールクラスＣ４１のサブクラスとして、自起動移動サブクラスＣ４１１，停止不可加減速移動サブクラスＣ４１２、停止可能加減速移動サブクラスＣ４１３、の各サ

ブクラスが存在している。これらのクラス間の協調動作により、ステッピングモータの制御が実現される。

【００４５】次に、その動作について説明する。スキャナ制御時におけるステッピングモータの駆動方式には下＊記表１に示す３種類があり、それぞれが使用されるケースとその特徴が表中に示されている。

【００４６】

【表１】

ステッピングモータの駆動方式	使用するケース	特徴
自起動移動	ホーミング中	直ちに駆動、停止できる。
加減速移動（停止不可）	リターン中 読み取り位置移動中	定速移動中に減速して停止することができない。
加減速移動（停止可能）	読み取り中	定速移動中にキャンセル要求、間欠停止要求により、減速して、停止することができる。

【００４７】３種類の駆動方式は、移動速度は遅いが、直ちに駆動、停止が行える自起動移動と、低速から徐々に加速し目標速度になると一定速度で駆動し、停止の際は徐々に減速する加減速移動があり、加減速移動は、さらに一定速度で移動している間に停止要求を受けると、減速して停止することができる方式（停止可能加減速移動）と、できない方式（停止不可加減速移動）の２種類がある。自起動駆動は、スキャナの初期化動作で走行体を待機位置まで移動する場合に使用する。この動作をホーミングと呼ぶ。停止可能加減速移動は、一定速度で移動している間のキャンセル要求に対応した停止や、画像メモリのニアフル状態発生時における間欠読み取りに対応した停止、再起動に用いるもので、停止不可加減速移動と比較すると、ＣＰＵパワーを消費する。従って、画像読み取り中のみ停止可能加減速移動を行い、画像読み取りを行わないリターンや、読み取り位置移動中は、ＣＰＵパワーをあまり消費しない停止不可加減速移動を用いる。

【００４８】これらの駆動方式でステッピングモータの駆動を制御するためのソフトウェアがステッピングモータ部品Ｃ４（図７参照）の内部に構成される。これはステッピングモータクラスＣ４０に結ばれたステッピングモータロールクラスＣ４１のサブクラスに自起動移動Ｃ４１１，停止不可加減速移動Ｃ４１２、停止可能加減速移動Ｃ４１３として構成される。これらの部品により構成されるモータ駆動制御システムの動作を以下に、説明する。このシステムは、ステッピングモータ部品Ｃ４に動作指示メッセージが送られてくることにより始動する。その指示は、前述の図９の動作に示したように、スキャン部品Ｃ１からステッピングモータの駆動方式に応じた動作指示メッセージとして送られてくる。即ち、BOOK読み取りの例では、読み取り位置移動中には停止不可加減速移動、読み取り中には停止可能加減速移動、リターン中には停止不可加減速移動が動作指示メッセージとして送られてくる。

【００４９】これらの指示は、ステッピングモータクラスＣ４０が受信し、指示内容に応じて必要なステッピングモータロールクラスＣ４１のサブクラスである自起動移動クラスＣ４１１，停止不可加減速移動クラスＣ４１２、停止可能加減速移動クラスＣ４１３のいずれかをステッピングモータロールクラスＣ４１の動作を介して接続する。ステッピングモータクラスＣ４０は、接続したステッピングモータロールクラスＣ４１のサブクラスに対して、ステッピングモータを駆動するための動作パラメータ（例えば、図８の速度線図を基に求められ、予め用意されている）を設定し、駆動開始の指示メッセージを送り移動を実施する。駆動が終了すると、このステッピングモータロールクラスＣ４１のサブクラスは、ステッピングモータクラスＣ４０に動作終了を終了メッセージにより知らせる。これを受信したステッピングモータクラスＣ４０は、スキャン部品Ｃ１に動作終了メッセージを通知する。

【００５０】また、ステッピングモータクラスＣ４０は、動作指示に応じてステッピングモータロールクラスＣ４１のいずれかのサブクラスを接続した後、動作パラメータの設定、駆動開始、停止等の指示を行うが、これらの指示の操作インターフェイスを統一する。これにより、ステッピングモータロールクラスＣ４１のサブクラス接続後は、サブクラスの種類によらず同一の操作手順で、ステッピングモータの動作パラメータの設定や、駆動開始の指示が行える。従って、今後異なるステッピングモータの駆動方式が追加された場合、新たにステッピングモータロールクラスのサブクラスを追加し、そのサブクラスを接続するだけで、新たな駆動制御を行うことができる。また、機種により、必要ない駆動方式があった場合は、必要ないステッピングモータロールクラスのサブクラスを削除するだけでそれ以外の処理を施すことなく、接続を解除することができる。このように、各ソフトウェア部品がメッセージ通信をやり取りすることで、スキャナ制御、ステッピングモータの駆動制御を実施することができる。また、機種により必要なステッピングモータロールクラスのサブクラス用いることで、本

ソフトウェア部品を多機種に対して適用でき、ソフトウェアの再利用性、開発効率を向上させることができる。

【００５１】以上述べたように、各ソフトウェア部品が協調動作することで、スキャナ制御ソフトウェアのサービスが実施される。スキャン制御ソフトウェアに新たなサービスを追加する場合は、新たなスキャンクラスのサブクラスを追加することで、機能の拡張ができる。また、機種により、必要ないサービスがあった場合は、必要ないスキャンクラスのサブクラスは削除し、使用しないようにすることができる。キャリッジ部品からスキャンクラスのサブクラスへ、指定された動作が終了したことを示す操作インターフェイスをcompleteに統一することで、新たにスキャンクラスのサブクラスが追加された場合でもキャリッジ部品の内容を変更する必要がない。さらに、以上で説明したスキャナ制御システムを画像形成装置に備えることによって、上記制御システムの機能を画像形成装置において実現することができる。

【００５２】

【発明の効果】請求項１に対応する効果：スキャナ制御を行うソフトウェアの構成を、読み取り要求を受けるソフトウェア部品と、読み取りを行う走行体を管理するソフトウェア部品と、キャリッジロール部品と、読み取り制御に必要なセンサ、ステッピングモータ等の各デバイスを直接制御するソフトウェア部品で構成し、各ソフトウェア部品を、互いに強調動作する独立した部品として構成し、各々が強調動作しながらスキャナの読み取り制御を行うことで、多機種に対して本ソフトウェア部品を適用し、かつ、スキャナ制御機能の拡張を容易にし、ソフトウェア開発効率を向上させることができる。

請求項２に対応する効果：キャリッジロール部品を抽象クラスとし、キャリッジロール部品のサブクラスとしてスキャン要求に応じたキャリッジの制御を行うソフトウェア部品で構成することで、スキャナに新規に機能を追加する場合、キャリッジロール部品のサブクラスを追加することで機能拡張ができ、スキャナ制御ソフトウェアの拡張性を向上させることができる。

請求項３に対応する効果：キャリッジロール部品とそのサブクラスのソフトウェア部品の操作インターフェースを同一にすることで、新規機能をキャリッジロール部品のサブクラスに追加した場合の操作インターフェースを同一にでき、スキャナ制御ソフトウェアの機能拡張を容易にし、ソフトウェアの信頼性を向上させることができる。

【００５３】請求項４に対応する効果：画像形成装置におけるスキャナ制御を行うソフトウェアシステムを、スキャン部品と、キャリッジ部品と、ステッピングモータ部品で構成し、各ソフトウェア部品を、互いに協調動作する独立した部品として構成し、各々が協調動作しながらスキャナの読み取り制御を行うようにしたことで、多機種に対して本ソフトウェアシステムが適用でき、かつ、スキャナ制御機能の拡張を容易にし、ソフトウェア開発効率を向上させることができる。

請求項５に対応する効果：　スキャナ制御を行うソフトウェアの構成を、スキャン部品と、キャリッジ部品と、ステッピングモータ部品とで構成し、スキャン部品の内部構成を、他の部品からの操作インターフェイスを持った抽象的なクラス（スキャンクラス）と、共通の操作インターフェイスを持つサブクラスで構成し、各ソフトウェア部品を、互いに協調動作する独立した部品として構成し、各々が協調動作しながらスキャナの読み取り制御を行うことで、スキャナの制御方式の追加、変更を容易にし、ソフトウェア開発効率を向上させることができる。

請求項６に対応する効果：　読み取りの要求を受け付け、要求に応じて順次走行体へ動作指示を行うソフトウェア部品の構成を、他の部品からの操作インターフェイスを持った抽象的なクラス（スキャンクラス）と、共通の操作インターフェイスを持つサブクラスで構成し、上記スキャンクラスのサブクラスが、原稿読み取りを行うソフトウェアの各サービスに対応して存在し、各サブクラスがサービスの内容に応じた、キャリッジ部品の使い方の情報を保持しており、つまりを知っており、キャリッジ部品への必要なメッセージを送ることで原稿の読み取り制御を実施する。従って、スキャナ制御ソフトウェアの機能（サービス）の追加、変更を容易にし、ソフトウェア開発効率を向上させることができる。

請求項７に対応する効果：　上記キャリッジ部品からスキャンクラスのサブクラスへの操作インターフェイスを統一することとすることで、スキャナ制御ソフトウェアの機能（サービス）の追加・変更時に他のソフトウェア部品の変更量を少なくし、ソフトウェア部品の信頼性を向上させることができる。

【００５４】請求項８に対応する効果：　ステッピングモータの駆動を行うソフトウェア部品の内部構成を、ステッピングモータの状態管理を行うクラスと、ステッピングモータの駆動する役割を持った抽象的なクラスと、上記ステッピングモータロールクラスのサブクラスで、ステッピングモータの駆動方式に応じてデバイスを制御するクラスで構成することにより、ステッピングモータの駆動方式の追加、変更を容易にし、ソフトウェア開発効率を向上させることができる。

請求項９に対応する効果：　ステッピングモータロールクラスのサブクラスへの操作インターフェイスを統一することで、モータ駆動方式の追加・変更を容易にし、かつソフトウェア部品の信頼性を向上させることができる。

請求項１０に対応する効果：容易に機能拡張ができるスキャナを備えているのでユーザのニーズに合った画像形成装置を容易に実現することができる。

【図面の簡単な説明】

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【図１】　本発明のユーザーインターフェースが適用されるイメージ入出力装置である。

【図２】　イメージ入出力装置内部に組み込まれたソフトウェアとハードウェアの相互関係を説明する図である。

【図３】　デバイスマネージャのソフトウェア構成を説明するための図である。

【図４】　スキャナー制御部のソフトウェア構成を説明するための図である。

【図５】　ブック読み取り時における各ソフトウェア部品のメッセージ通信の様子を説明する図である。

【図６】　キャリッジのホーミング動作時における各ソフトウェア部品のメッセージ通信の様子を説明する図である。

【図７】　スキャナー制御部のソフトウェア構成を説明するための他の図である。

【図８】　Book読み取り時のステッピングモータの時間＊

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＊ー速度の関係を示す図である。

【図９】　Book読み取り時の各部品間のメッセージ通信を示す図である。

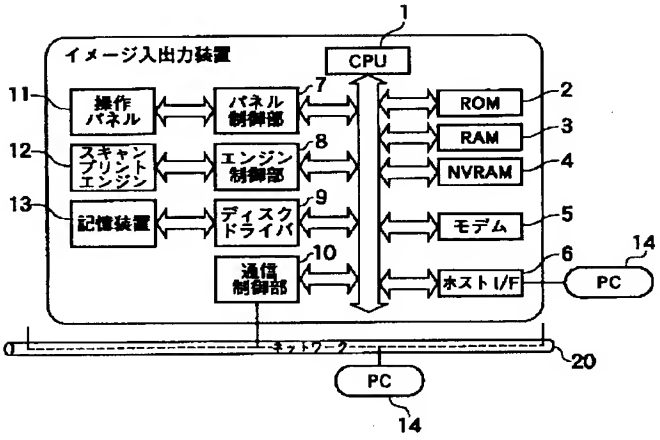
【図１０】　スキャン部品の内部構成を示す図である。

【図１１】　ステッピングモータ部品の内部構成を示す図である。

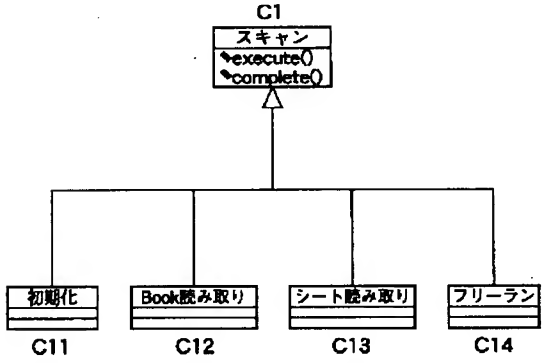
【符号の説明】

１…ＣＰＵ、　２…ＲＯＭ、３…ＲＡＭ、　５…モデム、６…ホストＩ／Ｆ、　７…パネル制御部、８…エンジン制御部、　９…ディスクドライバ、１０…通信制御部、　１１…操作パネル、１２…スキャンプリントエンジン、　１３…記憶装置、１４…ＰＣ、　１００…アプリケーション、１１０…カーネル、　１２０…ドライバ、１３０…ハードウエア。

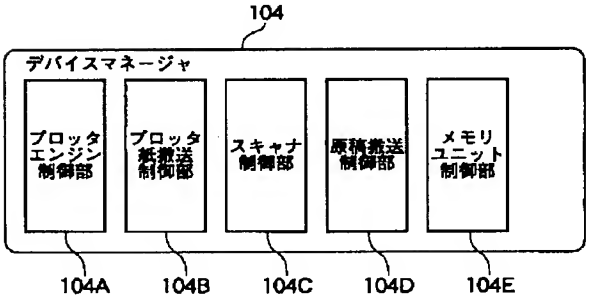
【図１】



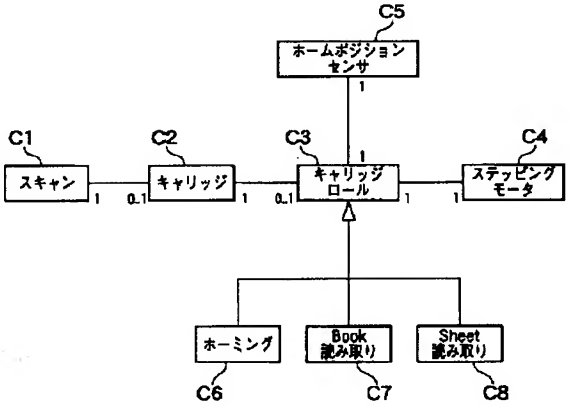
【図１０】



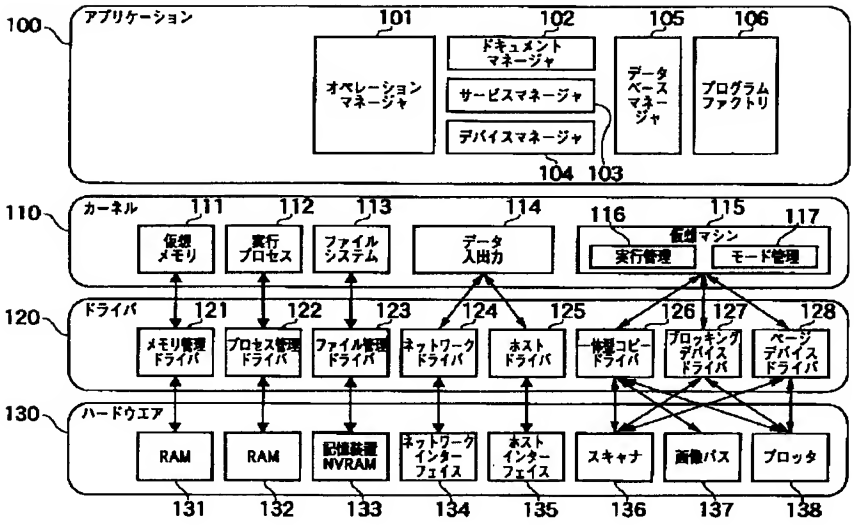
【図３】



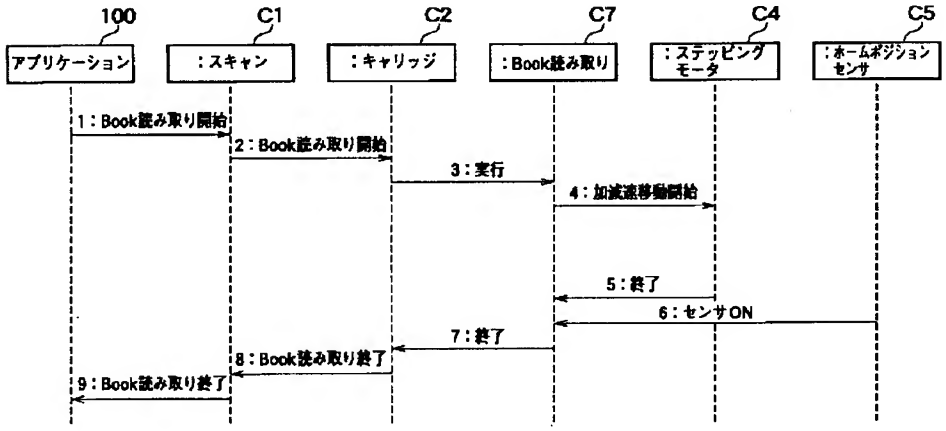
【図４】



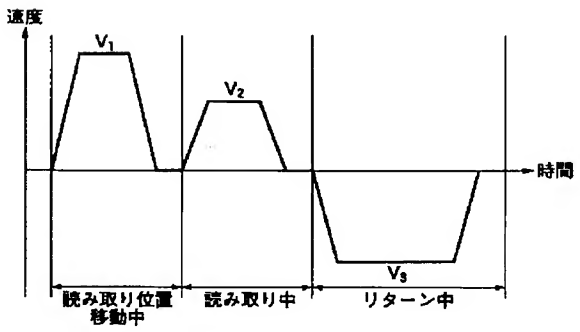
【図２】


100
アプリケーション
101
オペレーションマネージャ
102
ドキュメントマネージャ
サービスマネージャ
デバイスマネージャ
104
103
105
データベースマネージャ
106
プログラムファクトリ
110
カーネル
111
仮想メモリ
112
実行プロセス
113
ファイルシステム
114
データ入出力
116
仮想マシン
実行管理
115
117
モード管理
120
ドライバ
121
メモリ管理ドライバ
122
プロセス管理ドライバ
123
ファイル管理ドライバ
124
ネットワークドライバ
125
ホストドライバ
126
物理コピードライバ
127
ブロッキングデバイスドライバ
128
ページデバイスドライバ
130
ハードウエア
RAM
RAM
記憶装置NVRAM
ネットワークインターフェイス
ホストインターフェイス
スキャナ
画像バス
プロッタ
131
132
133
134
135
136
137
138

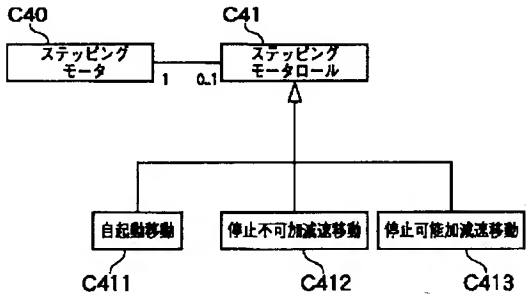
【図５】


100
アプリケーション
C1
：スキャン
C2
：キャリッジ
C7
：Book読み取り
C4
：ステッピングモータ
C5
：ホームポジションセンサ
1：Book読み取り開始
2：Book読み取り開始
3：実行
4：加減速移動開始
5：終了
6：センサON
7：終了
8：Book読み取り終了
9：Book読み取り終了

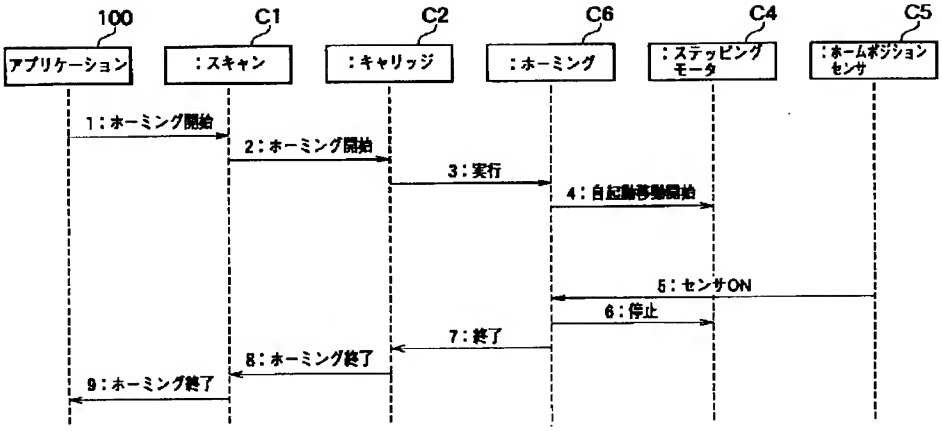
【図８】


速度
V1
V2
V3
時間
読み取り位置移動中
読み取り中
リターン中

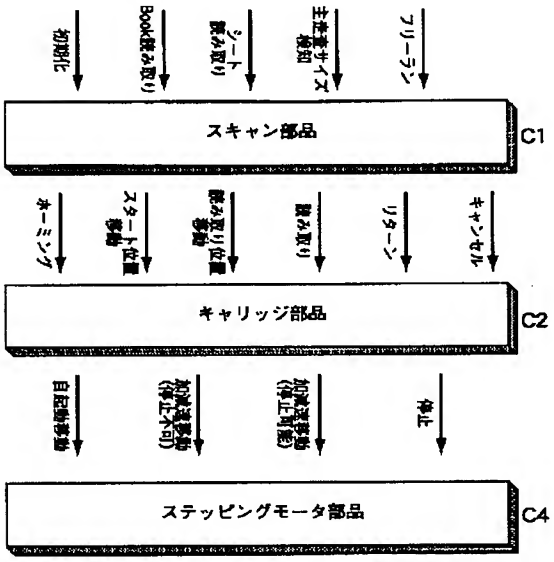
【図１１】


C40
ステッピングモータ
1
0..1
C41
ステッピングモータロール
自起動移動
停止不可加減速移動
停止可能加減速移動
C411
C412
C413

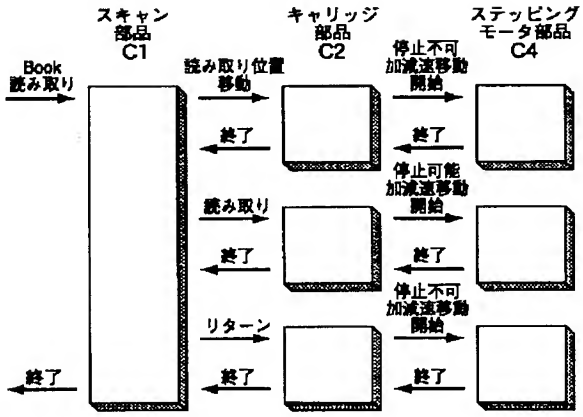
【図６】


100
C1
C2
C6
C4
C5
アプリケーション
：スキャン
：キャリッジ
：ホーミング
：ステッピング モータ
：ホームポジション センサ
1：ホーミング開始
2：ホーミング開始
3：実行
4：自起動移動開始
5：センサON
6：停止
7：終了
8：ホーミング終了
9：ホーミング終了

【図７】


初期化
Book読み取り
シート読み取り
主走査サイズ検知
フリーラン
スキャン部品
C1
ホーミング
スタート位置移動
読み取り位置移動
読み取り
リターン
キャンセル
キャリッジ部品
C2
自起動移動
加減速移動(停止不可)
加減速移動(停止可能)
停止
ステッピングモータ部品
C4

【図９】


スキャン部品 C1
キャリッジ部品 C2
ステッピングモータ部品 C4
Book読み取り
読み取り位置移動
停止不可加減速移動開始
終了
停止可能加減速移動開始
読み取り
リターン
終了